

PCWorld

FOCUS

ON
LOAN.

October 1989 number 8

BUSINESS SOLUTIONS FOR PC USERS

WORD
PROCESSING
P 38 8/44

PICKING A POWER PC

Top 286 & 386 Machines on Test

Focus Extra: What's new in word processing



Free with Personal Computer World

WIN A 386-BASED
COMPLETE
COMPUADD
SYSTEM



QUALITY YOU CAN COUNT ON



286

A comprehensive range of 286 systems with compact and low profile case designs. With processor speeds from 6 to 26MHz, the ITS 286 is ideal for demanding office and DTP applications.

A wide range of options including mice, modems and fax allow us to configure a system to match your exact requirements.

Prices from only £885.



386

80386 performance systems with options for 80287, 387 and Weitek co-processors. 2Mb RAM as standard on the motherboard upgradeable to 8Mb.

Landmark speed test of 27MHz with 43MHz and higher speeds soon available.

Supplied as standard in a tower case the ITS 386 is an ideal CAD workstation, network file server or multi user Xenix processor.

Prices from only £1,999.

All ITS systems are supplied with:

Quality flicker free flat screen monitors on tilt and swivel bases, and ergonomically designed tactile keyboards to ensure that your ITS system is comfortable to use.

XTRA

Industry compatible but with features which set it apart, the ITS entry level system runs at 4.77/10MHz, and XTRA includes 640K RAM, serial and parallel ports, clock and calendar and the same quality keyboard and monitor as ITS 286 and 386 systems.

XTRA prices from only £599.



Quality and thoroughly tested components and motherboard designs combined with comprehensive preshipment testing to ensure that your ITS system performs efficiently and reliably.

Quality service from helpful and informed sales and technical staff to ensure that you receive a system suited to your needs.

PORTABLE 286

The first truly portable 286 to give you all this. 8/12MHz 80286 CPU with 80287 option.

1Mb RAM as standard - can be upgraded to 4 Mb without using an expansion slot. Paper white high resolution (720 x 400) double supertwist LCD display with cold cathode backlight for use under any lighting conditions EGA colours map onto shades of grey. Internal diskette (1.44Mb 3.5") and 25ms, 40Mb hard disk.

2 internal expansion slots (full length 16-bit & half length 8-bit).

Serial and parallel ports, and external connectors for diskette drive and monitor (mono to multisync).

Flexible power options - AC mains supply, 12VDC vehicle battery and its own internal rechargeable sealed lead acid battery.

All inside a case only 90x380x340mm and weighing 16lbs.

ITS Portable prices from only £2325 with 40Mb hard disk.



I would like to learn more about ITS Computers.
Please send me further details.

Name

Position

Company

Address

.....

.....

Tel.

For further information please telephone or complete the attached coupon.

All systems are shipped fully configured with Microsoft DOS 4.0 or SCO Xenix, a free word processor, database, spreadsheet and user definable menu manager. All items carry a 12 month guarantee and any hardware item may be returned in its original condition within 30 days of purchase for a full refund.

PCWorld ^{FOCUS}

October 1989 Number 8

BUSINESS SOLUTIONS FOR PC USERS

CONTENTS

6

Micro Muscle

Many of us are being tempted by the proliferating number of 80286 and 80386 PCs on offer, and wondering when is the right time to upgrade. Rupert Goodwins offers some advice.

12

Fast Bargains

Competition among 80386 PC suppliers has driven their prices down. Andy Redfern reviews the best bargains you can pick up.

19

Economy Power

Rupert Goodwins looks at 286 PCs, still powerful in most people's eyes and better value than the newest boxes.

NOT GOOD ENOUGH

FOR WINDOWS.

Top Stream Machines

For the real connoisseur, the designers of 386 machines are squeezing more speed and faster memory operation out of the same chip, using a variety of technical tricks. Peter Jackson tries out some examples.

28

Competition

Your chance to win a CompuAdd 386SX PC with Hewlett Packard LaserJet II printer and Microsoft software and mouse.



6

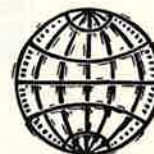


24

32

PC Table

A round-up of the current crop of desktop PCs.



FOCUS EXTRA

38

Text Expectations

This year's new word processing packages have extended themselves well beyond the realms of simply getting words down onscreen. Peter Worlock reports on what you can expect to get with your new WP purchase.

44

Word Extras

Roland Newman relays some techniques for getting the fullest use out of word processing software.

48

Glossary

A guide to the jargon that can shroud the use of personal computers.

Editor in Chief Derek Cohen, **Editors** Steve Mansfield, Tim Ring **Art Director** Martyn J Rowbotham, **Publishing Director** Mike Agate, **Publisher** David Mankin, **Publishing Manager** Jan Pitt, **Production Controller** Simon Maggs, **Production Manager** Jim Hewlings, **Production Assistant** Ros Hall, **Group Advertisement Manager** Moira Thomson, **Advertisement Manager** Nick Ascough, **Senior Sales Executive** Mary de Sausmarez, Fay Callow, **Sales Executives** Sarah Metcalfe, Julia Olmer, Martin Miller, Pranava Oza, Adrian Jenkins. **Sole Taiwan Agent** Talwan Bright. Contact Christine Wu. Tel: (02) 7557901, Fax: 886-2-7557900 Taipei, Taiwan, R.O.C. No material may be reproduced in whole or in part without written consent from the copyright holders (C) VNU Business Publications 1989. Typeset by Phase Communications, Pioneer House, 44/48 Clerkenwell Road, London EC1. Printed by Chase Web Offset, Plymouth, Devon. Distributed by Comag Ltd, Tavistock Road, West Drayton, Middlesex. Tel: (0895) 444055.

Atari 520STFM POWER PACK

only
£319*

COMPUTER EXPRESS

NORTH LONDON



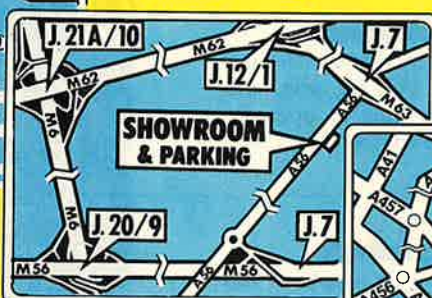
99 Park Street Lane,
BRICKET WOOD,
St Albans, Herts AL2 2JA.
(0727) 72790

WEST LONDON



304 Kingshill Ave,
(off Uxbridge Road)
HAYES, Middlesex.
01-841 8744

MANCHESTER



85 Washway Road (A56),
(opposite IBM)
SALE, MANCHESTER M33 1TQ.
061-962 0780

SHOWROOM OPENING HOURS:

Monday-Friday 9am-6pm
Saturday 10am-5pm

BIRMINGHAM



1046 Coventry Road (A45),
HAYMILLS, BIRMINGHAM B25 8DP
021-772 5212

ATARI 520STFM

with 1 Megabyte Drive and
New POWER PACK of software.

worth over £550 worth at rec. retail price,
with Atari BASIC and CX40 Joystick.

including Afterburner, Black Lamp, Bomb Jack, Bombuzal, Double Dragon, Eliminator, Gauntlet II, Nebulus, Outrun, Overlander, Pacmania, Predator, R-Type, Space Harrier, Star Goose, Starglider, StarRay, Super Hang-on, Super Huey, Xenon. Plus Business Software - Organiser, Hisoft First Basic, and First Music.

Only **£319.00***

(£374.33 including VAT and next day delivery.)

Plus many more bargains....

ATARI 520STFM

With 1 Megabyte Drive & SUPER PACK of software. Worth over £450 worth at normal retail price. Including Organiser Business Software, Chopper X, Ranarama, Starquake, Genesis, Black Lamp, Thrust, Test Drive, Buggy Boy, Quadralien, Xenon, Wizball, Seconds Out, Zynaps, Marble Madness, Beyond Ice Palace, Thundercats, Summer Olympiad, Arkonoid II, Eddie Edwards, Ikari Warriors.

Special Price £279.00*
(£328.25 including VAT and next day delivery.)

ATARI STARTER KIT

Exclusive to Computer Express. Contains ST OWNER'S SECOND MANUAL, 5 DISKS OF PUBLIC DOMAIN SOFTWARE and DELUXE MOUSE MAT £10.00*

EXPLORER PACK

Atari 520STFM with 1Mb Built-in Disk Drive, Mouse, Ranarama, Tutorials, Atari ST BASIC.
Special Low Price £249.25*

PROFESSIONAL PACK 1040

Atari 1040STFM with Microsoft Write, Superbase Personal, VIP Professional and Atari BASIC.
Special Low Price £409.00

ATARI HARDWARE

Atari SM124 12" High Res Mono Monitor	£119.00
Atari SC1224 12" Med Res Colour Monitor	£239.00
Cumana 1Mb Double sided 3.5" Disk Drive	£96.71
Philips 8833 Med Res Colour Monitor - Excellent Buy	£243.77
Supra Drive 30Mb External Hard Disk - Auto Boot!	£478.00
Atari SLM804 Laser Printer 8 pages/min 300dpi	£1097.00
Supra 2400 Modem V21/V22/V22bis	£168.68
Pace Linnet Modem V21/V23 with cables	£104.77

ATARI MEGA ST

With 1Mb Drive, Mouse and Professional Pack Software	
MEGA 1 - 1Mb RAM	£528.94
MEGA 2 - 2Mb RAM	£846.94
MEGA 4 - 4Mb RAM	£1113.93

PRINTERS

Epson LX800 - Low Cost Epson Quality	£168.68
Epson LQ500 - 24pin Letter Quality Favourite	£290.19
Star LC-10 - Number One Low Cost Printer	£185.00
Star LC-10 Colour - Colour At Very Little Extra	£220.00
Seikosha SL80 - High Speed Letter Quality	£289.00
NEC P2200 - Never Beaten For Value For Money	£289.00
Panasonic 1081 - For Low Priced Performance	£151.70
Panasonic 1180 - 4 Fonts And More Speed	£169.73

COMMODORE AMIGA 500

With free Modulator	£339.48
With free 7 Pack Games Software	£367.00

AMIGA HARDWARE

Amiga Mini Genlock	£99.00
Amiga External Drive 3.5"	£93.21
Amiga 500 External 20Mb Hard Disk with SCSI	£499.00

Large Range of Popular Atari and Amiga Software Available.

SCHNEIDER PERSONAL COMPUTER

A Quality PC at an unbelievably low price! The Schneider Euro PC is the ideal first time user's machine. Full size keyboard, choice of mono or colour monitor, twin floppy drives, with plenty of room for external expansion. Full 12 months warranty.

Euro PC 12" Mono	£399
Euro PC 14" Colour	£549
Schneider AT Single Drive Mono	£899
Single Drive 14" EGA Colour	£1149
Schneider AT 20Mb HD Mono	£1249
AT 20Mb HD 14" EGA Colour	£1399

*Prices exclude VAT and delivery.

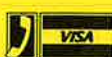
All prices/specs subject to change.

We're there because you're there.

CALL FOR FULL PRICE LIST
EXPORT AND TRADE ENQUIRIES WELCOME
TELEPHONE AND MAIL ORDERS WELCOME



CALL **0727 37451**



OVER 2,800 ITEMS AVAILABLE
ALL GOODS GUARANTEED
CREDIT CARDS NOT DEBITED UNTIL DESPATCH

COMPUTER EXPRESS

EVERY 'FIN' FOR YOUR COMPUTER

CORPORATE BUYERS WELCOME

Official purchase orders accepted from Government, Local Authorities and PLCs

FULL AFTER-SALES SERVICE

On-site maintenance contracts; installation and training; networking.

EXPANDING SHOWROOM NETWORK

Friendly personal service and sales advice.

ALL GOODS GUARANTEED

Free 28 days Customer Assurance Warranty on purchases over £1,000.

SCANNERS

Logitech Scanman - Great Software Makes This A Best Buy. £179

DISKETTES

Computer Express 5.25in DS/DD 48tpi disks box 10 £10.60
Computer Express 5.25in DS/DD 96tpi Hi-Density box 10 £16.90
Computer Express 3.5in DS/DD diskettes box 10 £14.70
Allsup Locking 5.25in Diskette Box (holds 80) £16.92

MODEMS AND COMMUNICATIONS

Callbox - Automates Your Telephone Work. £149
Pace Linnet V21/V23 Internal Modem Auto-dial/Auto-answer. £101
Miracle WS4000 V21-V23 Modem. £139
Miracle WS3000 V23bis Professional Modem. £139
Miracle Keyboard 3000 Internal Modem V22bis. £193
Amstrad MC2400 Internal Modem V21/V22/V23. £239
Amstrad SM4240 External Modem V21/V22/V23. £16
RS232C Serial Modem Cable.

RIBBONS

Epson FX800/LX800 Branded (also MP165, Juki 5610). each £5.00
Compatible FX805/600/LX800 Ribbon. each £2.97
Compatible Panasonic 1080-1081 Ribbon. each £4.99
Star LC-10 Black Ribbon. each £4.99
This is just a small selection of our wide range.
NOTE: Minimum quantity for mail order ribbon orders four units.

CABLES, SWITCHES & STANDS

IBM & Compatible Centronics Parallel Cable (Round). £13.99
Two-Way Printer T-Switch choose Serial or Parallel. £28.99
SpaceBase Adjustable Floor-Standing Printer Stand. £74.99
Universal Printer Stand - Holds Paper Under Printer. £39.99

FAX & TELEX

Procom Telex 20 Plus - Converts Your PC Into A Telex. £629
Express Telex with Printer - Complete System. £1649
Quadram JT Fax Card - Converts Your PC Into A Fax. £249
InterScan Desk Top Fax - A Gift At The Price. £749

NETWORKING

Ethernet Cards - Full 10mbps per Second. £249
3-COM - Full Range of Cards and Software. Call
Novell ELS - Entry Level Professional Networking. £689
Invisible Net - Ideal for MCA Machines and Fast. £389
Sage MainLAN - Fast and Low in Cost (2 nodes). £399

TAPE BACK-UP

Archive 40Mb Internal Tape Back-up (very fast). £299
Irwin External & Internal Back-up 20/40/64/80/120 Mb. From £359

ADD-ON BOARDS

AboveBoard - Intel with 512k installed. £359
AboveBoard - Intel AT 286 with 2Mb installed. £399
Expansion Card - Everex Mini Magic RAM (chip extra). £163
Graphics - Paradise Auto-Switch EGA-480 Card. £197
Graphics - Video Seven VGA Card. £102
Graphics - Everex EverGraphics Plus (Clone Hercules). £649
Emulation - AST 3780 Terminal Emulation Card. £579
Emulation - AST 5251 Model 12 Remote Emulation Card. £799
Multifunction Card - AST SixPack Plus 384k memory. From £89
RAM Cards - AT & XT RAM expansion always in stock.

32Mb FILECARD

Need extra hard disk storage on your PC? Fit a 32Mb hard disk on a card, in a spare slot and carry on computing! Can operate as drive C: or D: on your PC to give a full 32Mb of extra storage. Fast access times of 65ms sec. £221.73

LOTUS 1-2-3 Version 2.3

This market leading Spreadsheet again moves ahead of its competitors. The long promised improvements are incorporated into Version 2.3 out anytime now. Still easy to use, but now with impressive graphics. Multiple Spreadsheets can be linked together. Version 2.3 for XT and 8086 based PC. £274.89

LOTUS 1-2-3 Version 3

The new Lotus 1-2-3 for 386 and 286 computers. 3 dimensional spreadsheets to extra power to your analysis. Can read all other Lotus files to make your transition easier. Easy graphics and immense power. £281.99

EPSON LQ850 and LQ1050

These hot favourites from Epson are the most popular 24 pin printers on the market. At speeds of 220cps draft and 73cps in 24 pin letter quality mode, they're on everybody's short list. This is one you won't regret. Remember, they have a built-in tractor feed and paper parking as standard. LQ850. £471.00 LQ1050. £598.00

ALDUS PAGEMAKER V3

Pushing Ventura hard for the number one DTP soft PageMaker now offers support for long documents, automatic text flow, 20 style sheets, support for spot colour, bitstream custom font generator, and near typeset quality output. £499.81

Official purchase orders accepted from Government, Local Authorities, Universities & PLCs. Others with prior approval only. All prices and specifications subject to change and availability without notice. Delivery charges extra. All items guaranteed. No returns or repairs accepted without a Returns Authorization Number obtainable from our Technical Support Department. Defective dead on arrival (within 28 days from purchase) merchandise repaired immediately at our carriage expense. Carriage on warranty repairs is paid by the customer. Non-defective credit returns subject to a 15% restocking fee.

FOR FULL PRICE LIST PLEASE CALL
EXPORT AND TRADE ENQUIRIES WELCOME
TELEPHONE & MAIL ORDERS WELCOME

dBASE IV

At last it's here! The new version of the UK's most popular Database software. Lots of new features to make all its competitors obsolete (so Ashton Tate hope!). New pull down menus make it easy to learn. £392.52

MICE FROM MICROSOFT & LOGITECH

If you need a mouse the Microsoft bus or serial version are the ones for you! Now with free software giving you a choice of Mouse Menus and Paintbrush, or Windows and Paintbrush. £98 to £109
Choice of Logitech Mice to fit on the Serial Port or in a Bus Slot. Logimouse C7 Serial - This 3 button opto-mechanical mouse comes complete with software and LogiMenu. £79

MICROSOFT WORD 5

The word is out on how to make professional output an everyday event! The advanced features of Word 5, like style sheets and PageView, help to speed you through both large and small jobs. On-line tutorial and 'undo' command makes it ideal for first time users. This is the package to use for producing contracts. 130,000 word spell checker and Thesaurus. Supports almost every printer or laser. £275.84

MICROSOFT EXCEL

A new generation spreadsheet for high performance 286s and 386s. Combines a powerful spreadsheet with a fast flexible database and extraordinary business graphics (44 different charts). Intelligent recalculation, linked worksheets, and a full array of auditing tools make Excel stand out from the other spreadsheets. Don't just take our word for it try it for yourself or ask an Apple user. £275.82

VENTURA

The professional's DTP! Produces quality documents easier and faster. Contains Style Sheet and can import files from AutoCad, GEM, Lotus etc. Full WYSIWYG with drop down menus. Try it with a Xerox 4020 printer to print your output in colour. See our Timeworks advert below for new low cost fonts for Ventura. £508.71

TIMWORKS

An excellent package for anyone wanting to make a start in DTP for a very modest sum. Timeworks is very popular, and has good telephone support from the manufacturer and ourselves. £95.00
NEW low cost fonts for all DTP. 9 super faces to choose from. Just £29.00 each.

HP DESKJET PLUS

NEW. Now even faster! Still superb Laser quality but at more lines per minute. Print resolution of 300dpi for both medium font text and full page graphics. Can be used like a laser or like a normal printer with print speeds of 320cps in draft and 160cps in true Letter Quality. Built-in auto sheet feeder and 10k buffer. A snap at £819.00. DeskJet standard 240cps draft, 120cps LQ. £540.00

SUPERCALC 5

The new, improved alternative to Lotus 1-2-3 and its clones. Many new features make this one worth considering. They say it is everything Lotus should have been. Easy to use and quick, good graphics, it may be number two, but it tries harder. £221.82

SMARTWARE II

This easy to learn and use Smart System has greatly improved! This popular integrated package now has a new word processor with thesaurus, faster spreadsheet handling, a fully relational database to give you faster easier access to your data, and enhanced graphics for all business applications. It will drive more printers and displays, including VGA, and to make you life easier there tutorials, improved instruction manuals and manuals. The old Smart System was good - the new one is absolutely brilliant. £379.27

EPSON LQ2550

Impressive but not expensive when you consider all its features, this true letter quality speeds through printing (400cps draft, 133cps LQ). You won't find a printer to beat this one. 24 pin printing, 132 column with built-in tractor feed, 360dpi graphics, up to 5 copy multipass stationery printing. Colour as standard. 7 resident fonts including a script for very personal letters. £899.00

SPECIAL PCAX2 EGA OFFER

At last! A fast (12MHz) AT compatible machine at a price you can afford. This Special Offer comes bundled with MS-DOS, Keyboard, 14in EGA Colour Monitor and 20Mb base unit. All you need in a small size footprint. £1249.00

EPSON AX40 VGA SPECIAL

A 80286 chip AT compatible machine with a new 12MHz processor speed. A fast 28 msec 40 Mb hard disk. 6 expansion slots ready for memory expansion when OS/2 seriously arrives. Our special deal comes complete with VGA card and 12in VGA colour monitor. £1799.00

EPSON FX850 and FX1050

The world's longest running printer series. These 9 pin workhorses will go on and on. Now with 10% more speed to give 264cps in draft and a smart 54cps in correspondence quality. The FX1050 can deliver up to 272 characters per line in condensed print. Single button switching between continuous and single sheet paper feeding. Pant buffer for up to 4 pages. FX850. £359.00 FX1050. £429.00

NEC P2200

At last! 24 pin quality that everybody can afford, with NEC's renowned reliability to match. This little baby cruises along at 168cps in high speed, 140cps in standard and a really nippy 56cps in 24 pin letter quality mode. This printer should be on any discriminating buyers list. £289.00

HEWLETT PACKARD LASERJET SERIES II

SUPER VALUE



The quality of Hewlett-Packard Lasers make them very popular. 8 page per minute, with the first copy out in 13 seconds. Works with all popular software at 300 dots per inch. Good crisp dense prints give a feel of quality to all your output. Ideal for producing business letters. Has a standard 512K RAM which can be expanded upto 4Mb for faultless full page graphics. Large choice of additional fonts for special output. Now with 12 months on-site maintenance at no extra cost, although we know from our large number of satisfied customers that you won't be needing it. £1484
New Double Sided printing LaserJet IID. £2174
Automatic Envelope Feeder for LaserJet IID. £245

db PUBLISHER



True DATABASE PUBLISHING you have always dreamed about. Great for Price Lists, accounts, directories, reports and merged letters. Imports data from all popular databases, spreadsheets, word-processing and graphics packages. Flexible, user-friendly and very powerful. Prints on any HP compatible laser, Epson type printer or true typesetting equipment. Requires a 286 PC, mouse and EGA/VGA monitor. If you produce regular items involving numbers or data then don't dream any longer, call today. £395.

TANDON PCA-sl



Tandon computers now offer the best value and reliability around. The latest addition to their fast selling range is the Tandon PCA-sl. This surprisingly inexpensive slim-line machine is ideal for business, educational and home use. AT style, 12Mhz processor, and plenty of room for future expansion. Choice of Hard Disk size and monitor (Mono, EGA or VGA) to suit your particular needs and budget. Standard 1.2Mb 5.25" Floppy but we can add a second 3.5" 720K drive. 640K RAM, 102 key AT style keyboard. Tandon PCA-sl single floppy Mono Monitor. £943
Tandon PCA-sl 20Mb Hard Disk Mono Monitor. £1084
Tandon PCA-sl 40mb Hard Disk 14" EGA Colour Monitor. £1499

CALL 0727 37451



OVER 2,400 ITEMS TO CHOOSE FROM
FULL AFTER SALES SERVICE
CREDIT CARDS NOT DEBITED UNTIL DESPATCH

NATIONWIDE SHOWROOMS

NORTH LONDON • 99 PARK STREET LANE, BRICKET WOOD, ST ALBANS, HERTS AL2 2JA • (0727) 72790
MANCHESTER • 85 WASHWAY ROAD (A56), SALE, MANCHESTER, M33 1TQ • 061-973 2513
WEST LONDON • 304 KINGSHILL AVE, HAYES, MIDDLESEX • 01-841 8744
BIRMINGHAM • 1046 COVENTRY ROAD (A45), HAYMILLS, BIRMINGHAM, B25 8DP • 021-772 5212

ALL PRICES EXCLUDE VAT & DELIVERY

SHOWROOM OPENING HOURS: Monday-Friday 9am-6pm Saturday 10am-5pm

HEAD OFFICE: COMPUTER EXPRESS LTD • CAXTON CENTRE • PORTERS WOOD, ST ALBANS, HERTS, AL3 6XT • (0727) 37451 • FAX 0727 50819



FLIPPING GOOD PRICES

ESTABLISHED 1979
The leading mail order computer firm in the UK.
OVER £1 MILLION OF STOCK
Rapid despatch of all popular items.
NATIONWIDE SHOWROOMS
Friendly personal service and sales advice.
TECHNICAL & HOT LINE SUPPORT
Don't worry - if you bought it from us we're happy to help.
SPECIAL SERVICE
- ON-SITE MAINTENANCE CONTRACTS
- INSTALLATION AND TRAINING - NETWORKING
ALL GOODS GUARANTEED



Only Genuine UK versions. (Savings available on US versions. Ask for Details.)

COMPUTERS

	No Monitor	Mono	Colour	14"EGA	12"VGA	14"VGA
AMSTRAD						
PC2086 Single Floppy	£569	£664	-	£759	£854	
PC2086 Double Floppy	£664	£759	-	£854	£1139	
PC2086 30Mb Hard Disk	£854	£949	-	£1044	£1139	
PC2286 Double Floppy	£949	£1091	-	£1186	£1281	
PC2286 40Mb Hard Disk	£1281	£1424	-	£1519	£1614	
PC2386 65Mb Hard Disk	£2516	£2659	-	£2754	£2849	
PC1640 Single Floppy	£474	£569	£664*	-	-	
PC1640 Double Drive	£569	£664	£759	-	-	
PC1640 20Mb Hard Disk	£759	£854	£949	-	-	
PC1512 Single Floppy	£379	£474	-	-	-	
PC1512 Double Floppy	£474	£569	-	-	-	
TANDON						
PCA 12/SL Single Drive	-	£943	-	£1216	£1232	£1332
PCA 12/SL 20Mb Hard Disk	-	£1084	-	£1357	£1373	£1473
PCA 12/SL 40Mb Hard Disk	-	£1226	-	£1499	£1515	£1615
PCA 12 Single Floppy	-	£1424	-	£1683	£1699	£1799
PCA 12 20Mb Hard Disk	-	£1759	-	£2014	£2034	£2134
PCA 12 40Mb Hard Disk	-	£2010	-	£2268	£2285	£2385
PAC 286/12 & 30Mb Datapac	-	£1676	-	£1793	£1808	£1908
386/16SF Single Floppy	-	£2178	-	£2437	£2453	£2553
386/16 40Mb Hard Disk	-	£2513	-	£2772	£2789	£2889
386/20-SF Single Floppy	-	£2513	-	£2772	£2789	£2889
386/20 40Mb Hard Disk	-	£2890	-	£3150	£3165	£3265
386/20-70 70Mb Hard Disk	-	£3121	-	£3359	£3375	£3475
386/20-110 110Mb Hard Disk	-	£3247	-	£3485	£3501	£3601
386/33-110 110Mb Hard Disk	-	£4869	-	£5107	£5123	£5223
ATARI PCs						
PC3-DD Double Floppy	£439	£550*	-	£850	-	£989
PC3-30 30Mb Hard Disk	£539	£639	-	£939	-	£1079
PC4-60 60Mb Hard Disk	£1199	£1399	-	£1699	-	£1839
PC5-60 60Mb Hard Disk	£1999	£2299	-	£2399	-	£2799
EPSON PCs						
AX2 20Mb Hard Disk	£1099	-	-	£1249	£1279	£1379
AX-40 40Mb Hard Disk	£1449	-	-	£1599	£1599	£1799
AX-60 60Mb Hard Disk	£1899	-	-	£2259	£2289	£2379
PCs 20Mb Hard Disk	£1059	-	-	£1165	-	-
PCs Double Floppy	£719	-	-	£1029	-	-
OPUS						
Opus PC III 30Mb Hard Disk	£375	£999	-	£1319	£1179	-
Opus PC V 20Mb Hard Disk	£1269	£1319	-	£1639	£1689	-
Opus PC VI 40Mb Hard Disk	-	£1689	-	-	-	£1959
Opus PC VII	-	£3489	-	-	-	£3749
SCHNIEDER						
Euro PC	-	£399	£549	-	-	-
286 AT 512K Single Floppy	-	-	-	£779	£929	£1029
286 AT 1Mb 20Mb Hard Disk	-	-	-	£1579	£1679	£1779
OLIVETTI PCs						
M250 20Mb Hard Disk	-	£1799	-	£2199	-	-
M290 AT 20Mb Hard Disk	-	£2199	-	£2399	-	-
M290 AT 40Mb Hard Disk	-	£2599	-	£2899	-	-
M380 386 60Mb Hard Disk	-	£3099	-	-	-	£2979
M200 20Mb HD Twin Floppy	-	£1099	-	-	-	-

* Atari Mono Monitor is an EGA Mono. * Tandon VGA White Monitor * Amstrad 12" EGA (ECD)

PORTABLES

	CPU	No of Flop	Hard Disk	Screen Type	Our Price
TOSHIBA					
Ts200	386 20MHz	1x1.44	100Mb	Plasma	£5095
Ts100	386 16MHz	1x1.44	40Mb	Plasma	£3599
Ts300	286 12MHz	1x1.44	40Mb	Plasma	£2995
Ti600	286 12MHz	1x1.44	20Mb	LCD	£2599
Ti200HD	8086 10MHz	1x720	20Mb	LCD	£1795
Ti200FD	8086 10MHz	2x720	-	LCD	£1289
Ti100 Plus	8086 4.7MHz	1x720	-	LCD	£1039
SHARP					
PC-4602	8086	2x720	-	LCD	£1099
PC-4641	8086	1x720	20Mb	LCD	£1859
PC-5541	286 12MHz	1x720	20Mb	LCD	£2969
EPSON					
Portable FDD	V30 10MHz	2x720	-	LCD	£925
Portable HDD	V30 10MHz	1x720	20Mb	LCD	£1479
AMSTRAD					
PPC512	8086 8MHz	1x720	-	LCD	£379
PPC512D	8086 8MHz	2x720	-	LCD	£521
PPC640	8086 8MHz	1x720	-	LCD	£474
PPC640D	8086 8MHz	2x720	-	LCD	£617
ZENITH					
184	8088 8MHz	2x720	-	LCD	£1255
184-2	8088 8MHz	1x720	20Mb	LCD	£2059
ZP 286-02	286 12MHz	1x720	20Mb	LCD	£2795
ZP 286-04	286 12MHz	1x720	40Mb	LCD	£3595
ZP 386-04	386 12MHz	1x720	40Mb	LCD	£4495

MICE

Logitech Logimouse C7 with "Plus" Software Package	£79
Mouse Systems Optical Serial or Bus Mouse w/Pop-Up Menus	£105
Microsoft Bus or Serial Mouse - Mouse Menus/Paintbrush	£99
Microsoft Bus or Serial Mouse - With Paintbrush/Windows	£109

HARD DISKS

Western Digital 32Mb FileCard - Hard Disk On A Card	£221
Seagate ST225 20Mb Hard Disk w/VD controller & cables	£214
Seagate ST251 40Mb Hard Disk 40Ms Access & Controller	£350
Seagate ST251 40Mb Hard Disk 28Ms Access (Drive only)	£372
Plus HardCard 20Mb or 40Mb - the original Hard Card	£499/636

Let us quote you for supply of all computing equipment.
Extra volume discounts for the large user. Regular Special offers. Ask for details of our latest savings when you call. Export enquiries welcome. Credit accounts for large buyers. Send us details of your bankers and two trade references. Terms strictly 30 days net. Peace of Mind - If you rely on your computing equipment then our On-Site Maintenance Contract will have it repaired quickly.
Next Day Delivery Service on most popular items.

PRINTERS

	Speed	Price
9-PIN NARROW DOT MATRIX		
Epson LX800 - The Brand Leader! Best Seller!	150/40	£169
Epson FX850 - The Quality Choice	220/45	£359
Epson EX800 - Super Fast, Super Value!	259/50	£440
Panasonic 1180 - 4 Fonts and More Speed	192/38	£170
Panasonic 1081 - For Low Priced Performance	120/24	£151
Star LC100 - Everybody's Favourite Budget Printer!	144/36	£185
9-PIN WIDE DOT MATRIX		
Epson LX1050 - Its new and even faster	220/45	£429
Epson LX1000 - A Popular Workhorse!	250/50	£599
Panasonic P1592 - A Real Bargain, Mate!	120/24	£290
Star NX-15 - Rugged, Reliable and Fast	120/30	£279
24-PIN DOT MATRIX NARROW		
Epson LQ860 - New 24-Pin, Colour As Standard	290/88	£580
Epson LQ550 - Low Cost But Great Value	150/50	£291
NEC P2200 - The NEC Challenge in Price/Performance!	168/56	£289
Okidata SL800 - Robust and Feature Packed	270/90	£480
Seiko S1800 - Perfect Letter Quality	135/54	£269
Star LC24-10 - Low cost alternative to Epson	170/57	£299
Star N824-10 - With Versatile Font Options	218/72	£457
24-PIN DOT MATRIX WIDE		
Epson LQ2550 - The Rolls of Printers	333/111	£899
Epson LQ1050 - The Most Popular Wide Carriage	290/88	£599
Epson LQ1060 - New 24-Pin, Colour As Standard	290/88	£699
NEC P6 Plus - The New Reliable 24-pin Printer	265/90	£479
NEC P7 Plus - One of the Best 24-Pin Sellers Ever	265/90	£629
HIGH SPEED PRINTERS		
Epson DX5000 - With Automatic Paper Feed	533/60	£1159
Hewlett Packard RuggedWriter - Reliability Itself	480/240	£999
Okidata 393 - Will Run For Years And Years	450/120	£879
DAISY WHEEL		
Brother HR20 - True Letter Quality	20	£429
Brother HR40 - Quality With Free Sheet Feeder	40	£785
Juki 6300 - The Champion of Champions	40	£630
COLOUR		
Star LC-10 Colour - Best Cheap 80 column Colour!	144/36	£220
Cannon Ink Jet - 7 Colour Wide Carriage	37	£459
HP PaintJet - 1,000s of Colour Shades	-	£799
NEC P565XL - Heavy-Duty Colour Favourite!	-	£746
Okidata 393C - Rugged, Reliable Colour Printer	450/120	£912
Xerox 4020 - Colour Printer for Ventura	133	£1099
INK JET		
Cannon BubbleJet - Silence At Last!	-	£755
Epson SQ2550 - Epson's Ink Jet Winner	540/90	£890
HP DeskJet - Now Even Lower in Price	-	£540

LASERS

	Speed	Price
HP LaserJet Series II - The Best Laser Printer	8ppm	£1484
HP LaserJet IID - With Dual Bin and Feeds Envelope	8ppm	£2174
Brother HL-8 - The Reviewers Love This Laser	8ppm	£1529
Cannon LBP-8II T - Twin Bin with Cannon Quality	8ppm	£1779
Cannon LBP-8III - Scalable Fonts, and 1.5Mb RAM	8ppm	£2145
Epson GQ5000 - Now with Free On-Site Maintenance	6ppm	£1287
Kyocera F1000 - High Quality for the Professional	10ppm	£1589
Panasonic KX-P4450 - Super-Fast and Compatible	11ppm	£1489
Qume CrystalPrint WP - Crystal Quality, A Gem Price	6ppm	£970
HP DeskJet Plus - LaserJet Quality at InkJet Price	3.5ppm	£619

PLOTTERS & DIGITIZERS

	Size	Price
Roland DXY-880A - Low on Cost, High on Features	A3	£562
Roland DXY-1100 - New Range of Fast Plotters	A3	£679
Roland DXY-1200 - B Pen with Dual Interface	A3	£949
Roland DXY-1300 - 1 Mb Memory Plotter	A3	£1111
Roland DPX-2200 - Flat-Bed Plotter	A2	£2815
Hewlett-Packard HP-7440A Colourplot	A4	£719
Hewlett-Packard HP-7475A Graphics	A3/4	£1079
Hewlett-Packard HP-7550 Graphics Plus, 8 pen	A3/4	£2689
Hewlett-Packard HP-7570A Draftplot	A1/2	£2789
Cherry A3 Digitizer Tablet	A3	£453

MONITORS

Multisync		
NEC Multisync II - 800x600 res with VGA, EGA, CGA, Herc	£419	
NEC Multisync GS - 14" Paper White Mono 720x480 res	£169	
NEC Multisync Plus - 16" Colour	£799	
NEC Multisync XL - 20" Colour with flat square screen, 1024x768 resolution, ideal for CAD and DTP applications	£1690	
Enhanced Graphics		
InterQuadram 14" EGA Colour Monitor tilt/swivel	£289	
Philips 9043 Medium Resolution 14" EGA	£259	
Colour		
Philips 8833 14in Colour Stereo Monitor	£244	
Mono		
Everex Eversion 100 14" in Green, Amber or White	£109	

CHIPS & CO-PROCESSORS

64K dRAM chips (nine to make 64K)	£3.69
256K dRAM chips 12 nanoseconds (nine to make 256K)	£7.19
Intel 8087 5MHz Maths Co-Processor	£94
Intel 8087-2 8MHz Maths Co-Processor	£134
Intel 80287-8 8MHz Maths Co-Processor	£215
Intel 80287-10 10MHz Maths Co-Processor	£248
Intel 80387-20 20MHz Maths Co-Processor	£443

All Prices exclude VAT and Delivery.
All goods guaranteed.

All prices subject to change without notice.
Official purchase orders accepted from Government, Local Authorities, Universities and PLCs. Prices/Specifications subject to change without notice. All special offers are subject to availability. Credit Cards not debited until despatch. No returns or repairs accepted without our Returns Authorisation number. Defective dead-on-arrival merchandise repaired or replaced at our charge expense. Carriage on Warranty repairs to be paid by buyer. Non-defective credit return subject to 15% restocking fee.

SOFTWARE

WORD PROCESSING	
Borland Sprint - The Critics Rave About This Package	£147.09
GEM First Word Plus - Ideal for Self-Teach WP	£158.68
Lotus Manuscript II - All Singing, All Dancing WP	£275.23
Lotus Manuscript - Manages Your Words Professionally	£222.11
Microsoft Word 5 - Number 2 WP Package	£275.64
Multimate Advantage II - You Too Can Have An Advantage	£297.04
PPS: First Choice - Good and Cheap	£106.08
PPS: Professional Write - Great For Education	£190.95
Sage PC Write - Our Cheapest Word Processor	£77.83
WordStar 2000 Plus release 3 - The New Winner!	£254.04
WordStar Professional 5 - The Tops	£211.93
Word Perfect ver 5 - The New Number One Word Processor!	£225.92
Word Perfect Library - The Word Perfect Front End	£99.49
Word Perfect Executive - For the Exec on the Go	£159.12
INTEGRATED PACKAGES	
Framework III - The Ashton-Tate Gets It Together	£349.87
Lotus Symphony version 2 - Number 2 Best Seller	£374.10
Microsoft Works - It Works Despite Our Low Price	£103.97
Migent Alliance Plus - The World-Famous Cheap Package	£137.91
SmartWare II - Even The Best Has Now Been Improved	£379.27
DATABASES	
Ashton-Tate Rapid File - The Co-Resident Database	£201.56
Borland Paradox 3.0i - The Latest Multi-User Database!	£401.71
Cardbox Plus V4 - Works Just Like Index Cards	£249.00
DataEase - Applications Galore!	£530.22
dBase IV - Top Selling Professional Database	£392.52
FoxBase Plus - Famous dBase III+ Rip-off	£286.43
Superbase 4 - Now with Free Mouse, Works Under Windows	£369.00
SPREADSHEETS	
Borland Quattro - Low Cost 1-2-3 Work Alike!	£139.91
Lotus 1-2-3 - Top Selling Package In The World	£274.89
Lotus 1-2-3 V3 - New 3D Power for 386 machines	£281.99
Microsoft Excel - Unbeatable for Graphics	£275.82
Supercalc Version 5 - New Improved Lotus-Beater!	£221.82
VP Planner Plus - Multidimensional Database	£117.39
GRAPHICS	
Freelance Plus - Market Leading Graphics Package	£278.14
Harvard Graphics - The Package the Professionals Use	£254.87
Graphwriter II - Ideal for Regular Fast Graph Production	£318.00
GEM Artline - Graphics Like You've Never Seen Before	£389.87
PC Paintbrush Plus - Move Over Michelangelo	£366.00
VP Graphics - Cheap and Effective	£65.76
DESK TOP PUBLISHING	
Xerox Ventura DTP Version 2 - Best In Its Class	£508.71
Fleet Street Editor - Watch Out Murdoch Here We Come	£159.12
PageMaker 3 - The Aldus Claimed Market Leader	£499.61
Timeworks DTP - Celebrated Ventura Clone!	£95.00
ACCOUNTS	
Accounts II - Real Value for Money - Best Buy	£395.00
AccPak - Modular Professional Accounting Made Easy	£399.00
Multisoft Accounts - Very Easy to Use	£395.00
Multisoft Payroll - Double Your Money or Quits	£145.00
Sage Bookkeeper - You'll Wonder Where Your Money Went	£80.59
Sage Accountant Plus - Top Selling Cheap Accounts	£201.53
Sage Financial Controller - The Sage Top of the Range!	£318.23
Sage Payroll 2 - A Fun Event Computerised	£147.77
LANGUAGES	
Borland Turbo Pascal V5.5 - Classic Borland Product	£89.95
Borland Turbo Graphics Toolbox - Screens, Screens, Screens	£53.03
Borland Turbo Basic - Top Seller of All Time!	£74.25
Microsoft C Compiler - C how it goes	£293.86
Microsoft Quick Basic Compiler V4 - The Ultimate Basic	£72.20



COMPUTERS FOR EVERY 'PORPOISE'



ST ALBANS • HEAD OFFICE

NEC MULTI-SYNC MONITORS

The 14 inch Multisync II is now the defacto standard for quality and beauty in colour monitors. Not only is it supremely versatile in its application and excellent in screen clarity, the styling has yet to be beaten. Try it with a Paradise auto-switch EGA card or even a VGA adaptor! All NEC Multisync monitors are IBM Clone and PS/2 compatible, and have a tilt swivel base.

Multisync II - 800x600 res with VGA, EGA, CGA, HRC
Multisync GS - 14" Paper White Mono 720x480 res
Multisync Plus - 15" Colour
Multisync XL - 20" Colour with flat square screen, 1024x768 resolution, ideal for CAD and DTP applications

£419
£169
£759
£1690

MATHS CO-PROCESSORS

Fed up with waiting for your spreadsheet or database to run. Zip up the speed of your PC with a maths co-processor. Available for 8088, 286 & 386 machines at speeds from 5MHz to 25MHz. They can even make your Amstrad go faster.

Prices from £94.00

WORDSTAR PROFESSIONAL 5

The original mass-market WP package still continues to out-sell nearly everything in sight. WordStar addicts just can't seem to get enough. Depth and versatility for word processing experts, complete with mailmerge, SpellStar and Starfinder. All the features of version 4.2 plus many DTP file extras

£11.93

SHARP PORTABLES

A complete NEW range of Sharp Portables. If you like quality and style you'll love these babies! The top of the laptop range PC-5541 has a beautiful VGA screen and a speedy 40Mb hard disk. Don't be seen without one.

PC-4602 - Dual 3.5" 720K, Floppies, 640x400 Superwist LCD screen, rechargeable lead battery, just 5.5 pounds
PC-4641 - 40Mb Hard Disk, 640x400 Superwist LCD screen
PC-5541 - 40Mb Hard Disk, 286 processor running at 12MHz, 640K RAM expandable to 3.6Mb, single 1.44Mb 3.5" Floppy Drive, illuminated page white VGA screen, rechargeable Ni-Cad battery

£1099
£1859
£2969

EPSON LX800

This latest offering from Epson zips along at 150cps in draft and 25cps in NLQ. Comes complete with Parallel ECP or IBM Parallel interface as standard, plus top mounted tractor feed. Good clear typeface, and 80 column wide

£168.68
£230.55

PANASONIC 1180

A minor revolution in printing from Panasonic. This higher speed replacement for the 1081 will be this year's hot favorite. 193cps draft and 35cps in NLQ will make this a hit with everyone

£179.73

LOW COST NETWORKS

SPI InvisNET and Sage MainLAN give you networking convenience without networking cost! Both systems offer fast data transmission speed. Can be used to operate remote printers and share files. These networks can handle as many as 16 users without any real performance loss. Installation service available.

£389.00
£189.00

PC TOOLS DELUXE V5

Tools for the most dangerous jobs on your PC. PC Tools will help you to keep your system running at peak performance and help you when you go wrong. Its better than insurance for your PC. Includes utilities for disk caching and back-up at no extra cost

£49.49

FREELANCE PLUS

An incredible array of charts and graphs to give meaning to the numbers in your spreadsheets and database. The easy to use menu choice does not do justice to the power of this package. It uses colour as it should be used

£278.14

MICROSOFT QUICKBASIC 4

Suitable for both modular and structured programming QuickBASIC combines a compiler, interpreter and debugger. Superfast, and operates with most BASICs and interfaces with dBase III and 1-2-3. Can also create network applications

£72.20

SAGE ACCOUNTS

From a one-man business through to a multi-million pound business there is a version of SAGE accounts to suit you. Already tried and proven in thousands of UK companies. All major accounting functions covered including Payroll to current standards. Full advisory, and configuration service available.

£137.91
£319.23

AMSTRAD 1640

NOW with FREE on-site maintenance across the UK. The most reliable and popular machine in the Amstrad range and still the best value around. 8MHz 8086 chip, 640K RAM, Mouse, GEM MS-DOS, and a choice of Hercules Mono, full colour, or Enhanced Colour Display. For extra value buy a single drive version and fit a 32Mb FileCard!

Single Floppy Mono £474
Double Floppy Mono £569
20Mb Hard Disk Mono £759

Single Floppy Enhanced Colour £664
Double Floppy Enhanced Colour £759
20Mb Hard Disk Enhanced Colour £949

MULTIMATE ADVANTAGE II

This is the number 2 choice in professional W/P. Quick, efficient and loaded with features. Difficult to better or even match!

£297.04

Official purchase orders accepted from Government, Local Authorities, Universities & PLCs. Others with prior approval only. All prices and specifications subject to change and availability without notice. Delivery charges extra. All items guaranteed. No returns or repairs accepted without a Returns Authorization Number obtainable from our Technical Support Department. Defective dead on arrival (within 28 days from purchase) merchandise repaired immediately at our carriage expense. Carriage on warranty repairs is paid by the customer. Non-defective credit returns subject to a 15% restocking fee.

FOR FULL PRICE LIST PLEASE CALL
EXPORT AND TRADE ENQUIRIES WELCOME
TELEPHONE & MAIL ORDERS WELCOME

VEGA VGA

Bring the full capability of IBM PS/2 graphics to any IBM compatible PC. This card gives VGA resolution of 640x480 as well as 800x600 with a choice of 16 colours. And it runs at up to 400 times faster than current EGA boards. Operates with most quality monitors

£199.00

MULTISOFT ACCOUNTS

A new generation in business accounts software. User friendly, easy to understand and use, and it won't let you make a mistake. Very visual in the way it operates. Can be used for cash-only businesses or very large companies. It makes other budget priced accounting software appear to be sagging. Your money is safe with Multisoft. Ledgers and Invoicing (state 3.5" or 5.25" disks)

£395.00
£95.00

HARVARD GRAPHICS

Integrated charting and presentation graphics software - the industry leading business graphics product which won the most awards last year. Very high quality output to a wide range of printers, lasers, plotters, film recorders. Import and export facility to Ventura, PageMaker, 1-2-3, Wordperfect etc

£254.87

STAR LC24-10

This super value 24pin printer comes with 8 resident fonts, all selectable from the front panel. 80 column, 170cps in draft and 57cps in exceptional letter quality, with quiet print button. Paper parking and push tractor feed makes paper handling easy. Uses Epson LQ800 and LQ1500 software drivers

£299.00

MIRACLE WS4000 V22bis MODEM

Miracom offer the most popular range of Modems in the country today. The WS3000 V22bis is inexpensive, reliable, looks good and does a professional job. You can use it to transfer files between PCs, access Telecom Gold, One-to-One, Easylink, Prestel and bulletin boards. You also need a serial cable (E15) and software. Try Crosstalk 4 (E110.96) for business applications, or SageSoft ChatChat (D84.59) to access Prestel

£377.00

AST ADD-IN BOARDS

The real Rolls Royce of cards to upgrade all PC's Memory, EGA, extra ports, go faster boards, 5250, 3270, 2780 and all the popular cards. Call us first whatever you need

BORLAND QUATTRO

If you're shopping at this price-level, why buy anything else. Borland has always broken the industry mould in matters of price/performance, and this quality spreadsheet does everything more expensive offerings do, at half the price

£139.51

LOGITECH SCANMAN

Now there's a scanner you can afford to go with your DTP software. 4" wide scan for pictures and text

£179.00

LOTUS AGENDA

The Personal Information Manager. Helps you to structure your thoughts and then find the information at a future date without taxing your brain. Handles words just like a relational database. Our special introductory price

£222.11

NETWORK WORKSTATIONS

Low cost high quality workstations to attach to Networks, Minis or Mainframe. Choice of 8086 or 286 based machines with Mono or colour monitors. Cards available for Ethernet, 3Com, 3270, 3780, 5250 etc

EuroPC Mono £399
Schneider AT 512K Mono £799
Atari XT/PC Mono £550
Epson PCe Mono £819
Epson AX2 Mono £1159

EuroPC Colour £549
Schneider AT Colour 512K £949
Atari XT/PC Colour £699
Epson PCe EGA Colour £1049
Tandon SL Mono £979

STAR NB24-15

Immaculate letter quality printing at 72cps and draft at 216cps. Easy front control panel and wide carriage makes this a versatile workhorse. The Star standard push feed tractor saves paper

£588.33

COMPUTER SECURITY

Protect your Data and System from the dangers of prying eyes and fingers. We can offer you all the protection can ever need. Software locks, Anti-virus software, Encryption, System Fault Tolerance, as well as physical locks. Like burglar alarms don't fit one when it's too late - call us now for advice and the best equipment.

STAR LC-10 COLOUR

The star of the printer world. Already its topping the hit parades. For the money no other printer offers so much! 80 column multi-font printer with 8 resident fonts and paper parking. 144cps draft and 36cps in NLQ quality

£220.00
£185.00

CALLBOX

Organise your telephone work on your PC and let it do the dialing for you. Intelligent card, software, phonebook, and stylish speaker for your desk. Easy to use and after a few days you'll wonder how you managed without it

£129.95

SCHNEIDER PCs and ATs

A Quality PC at an unbelievably low price! The Schneider Euro PC is the ideal first time user's machine. Full size keyboard, choice of mono or colour monitor, twin floppy drives, with plenty of room for external expansion. Full 12 months warranty.

Euro PC 12" Mono £399
Euro PC 14" Colour £549
Schneider AT Single Drive Mono £899
Schneider AT 20Mb HD Mono £1249
Schneider AT 20Mb HD 14" EGA Colour £1389

WORDPERFECT 5

MARKET LEADER



The most popular Word Processing package ever. Real high performance supported by good reference documentation. Easy to learn and even easier to use. Multiple columns, graphics importing, mail merge, thesaurus and spell checker are just a few of the many advanced features. Site licence available for large users. Without doubt it will make even the most average document will look extra special.

£225.92

EPSON LQ1060 & LQ860

NEW

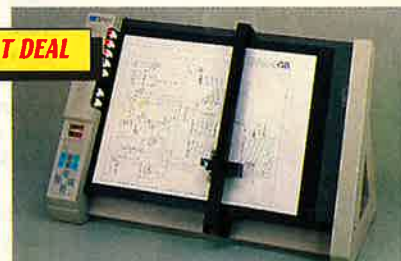


Uncompromising print quality, a wealth of features, plus an advanced paper management system ensure that Epson's LQ range will give you complete satisfaction every time. For those who demand the extra clarity and impact of colour in documents and letters these new 24 pin printers are just the thing. 7 distinctive colours to make business graphics come to life at a realistic cost. The wide carriage LQ1060 is just the thing to make your spreadsheets say more. And they are fast at 290 characters per second in draft and 88cps in true Letter Quality in two fonts.

Epson LQ1060
£699.99
Epson LQ860
£579.87

ROLAND PLOTTERS

GREAT DEAL



A3, A2 and A1 plotters at prices substantially below the market leaders. Roland high performance plotters give you all the features you will ever need. Plotting speeds up to 18" per second. 1Mb data buffer on the top of the range DX1-1300 to release your PC for more work and so you can plot the same drawing many times. Both parallel and serial interfaces are standard on the DX1 series. They can be driven by software configured for HP plotters.

A3 Flat bed (DX1-880A),
£562
A3 with 1Mb Memory (DX1-1300),
£1111
A2 Flat bed (DPX-2200),
£2815

CALL 0727 37451



OVER 2,400 ITEMS TO CHOOSE FROM
FULL AFTER SALES SERVICE
CREDIT CARDS NOT DEBITED UNTIL DESPATCH

NATIONWIDE SHOWROOMS

NORTH LONDON
MANCHESTER
WEST LONDON
BIRMINGHAM

• 99 PARK STREET LANE, BRICKET WOOD, ST ALBANS, HERTS AL2 2JA • (0727) 72790
• 85 WASHWAY ROAD (A56), SALE, MANCHESTER, M33 1TQ • 061-973 2513
• 304 KINGSHILL AVE, HAYES, MIDDLESEX • 01-841 8744
• 1046 COVENTRY ROAD (A45), HAYMILLS, BIRMINGHAM, B25 8DP • 021-772 5212

ALL PRICES EXCLUDE
VAT & DELIVERY

SHOWROOM OPENING HOURS: Monday-Friday 9am-6pm Saturday 10am-5pm

HEAD OFFICE: COMPUTER EXPRESS LTD

• CAXTON CENTRE • PORTERS WOOD, ST ALBANS, HERTS, AL3 6XT • (0727) 37451 • FAX 0727 50819



Micro Muscle

Should you opt for one of the more powerful PCs, asks Rupert Goodwins?

There's a common malaise in the world of personal computers. The symptoms are easy to spot; lack of memory, scarcity of room on hard disks, sluggishness or perhaps even incompatibility with the latest software. There's no hiding it — the computer you bought three years ago is due for retirement.

Up to a point, most micros can be upgraded to match the latest fashions. More memory, faster hard disks, even completely new processor chips can be plugged in to revitalise your machine. But there's always a price to pay; if a computer was based around the original IBM PC standard, then no matter how many go-faster boards are added the electrical paths between them will be restricted to a quarter of the width of the newer designs. And the more extra parts there are, the more reliability will suffer, and the greater the chance that some subtle incompatibility will stymie efforts to increase performance. It's a well known fact that when two boards don't work together, each manufacturer will blame the other, the computer, or you.

So it makes sense, at some point, to move on to a more powerful machine. It may cost more, but the reassurance of a brand new computer, with a brand new guarantee is worth a lot in itself. Whether to buy new, or merely upgrade, depends on your circumstances; in general, one or two shortfalls such as lack of memory or unsatisfactory graphics can be remedied by new boards; more than this and it's better value to take the plunge.

There are plenty of reasons why buying your second computer can be less painful than your first, and by far the best is yourself. In however many years you've been using your present computer, you've learned a great deal about what you do and don't like about it, and are in a good position to ask for — and check for — facilities that will suit the way you work. Also, one of the major success stories of the IBM standard world is compatibility; the chances are good that, whatever software you've been running on whatever vintage of compatible, you can transfer programs and data across with the very minimum of hassle to the newest, shiniest, fastest piece of technology.

Perhaps the first decision to make is how much of your old setup you want to carry on using. It's not always a good idea to buy new software to go with the new computer; you'll be throwing away a chunk of that valuable experience and increasing the chances of something unfathomable happening. But if you've got oodles of software and data on the old 5¼-inch floppy disk standard, you might have

problems if you decide to buy one of the new breed of slim computers that only have 3½-inch disk drives — there are ways around this, but it's another complication. Also, most computers come with a version of the MS-DOS operating system; if you've had your old machine for longer than a year or two then chances are that it's got an older version in which some things will be different — it's unlikely to be incompatible, even with the oldest PC software, but there may well be better ways of doing things.

If you want to transfer an expansion board — say, a video card or an extra serial port — to your new computer, then you won't be able to choose an MCA-based machine. These have a different sort of expansion connector, which works better with its own cards but not at all with the original PC standard. On the other hand, MCA machines tend to come with all mod cons built-in anyway, and they're still an expensive option, so this isn't often important.

What you expect from a new computer depends, of course, on the reasons you're leaving the old one. Most people, though, would like a faster machine; even on an undemanding task like simple word processing, any tardiness in loading and saving files, spellchecking and moving around a document can soon become frustrating. If you've got your new computer to run some particularly demanding software, like desktop publishing (DTP), graphics design or unusually large spreadsheets, then rest assured that every last ounce of speed will go down a treat.

There are various guides to how fast a particular computer will go. The most basic — and the one most often quoted by manufacturers — is the processor clock speed. This is counted in megahertz (MHz), and each MHz is a million ticks of the clock per second. There are various clocks in a computer, by the way, and the system clock is nothing to do with the real-time clock, a completely separate circuit that performs normal time and date-keeping functions. The computer obeys one instruction every eight, or so clock ticks, so an 8MHz machine will trot along at around one million instructions a second. This isn't guaranteed, since different chips (like the 80386-SX, as found in the Compaq 386S and others) can take longer to get instructions and thus have a lower instruction-to-clockspeed ratio.

Another thing that confounds the use of the clock speed as an infallible indicator is the reliance placed by the processor chip upon other components in the computer. If the



clock speed doubles, the memory circuits have to work twice as fast to keep the processor provided with instructions, and fast memory is expensive. So, although a computer might be able to deal with three million instructions a second, it might have to wait for a clock tick or four between each of them — if a computer's memory has 'wait states', then this is happening. Zero wait state memory works as fast as the processor.

There are some rather clever engineering compromises which can combine a fast processor with slow memory. One is interleave — the memory is divided up into two banks, and the processor reads instructions first from one, then from the other. Since each bank is read at half the rate that would otherwise occur, it can be slower and cheaper. The drawback is that it's not possible to guarantee that the processor will always skip from bank to bank, so there will be some speed loss in practice.

The other common cheap trick is the cache. This is a small (usually 32 or 64Kbyte) amount of memory that's fast enough to satiate the processor. Special circuits copy instructions and data from the slower memory into the cache; the trick lies in predicting what the processor will want to read, and then copying it in without slowing everything else down. These problems have been solved, and Intel — the company that makes the chips found in most high performance PCs — has produced a chip that does all the hard work, so caching is becoming both more common and cheaper.

There are four kinds of processing chip that are found in fast PCs. The oldest is the 80286, the first significantly better design since the IBM standard established itself. It goes faster, and accesses data more efficiently, than the 8088/8086 processors found in slower machines, but there are some major mistakes in its design which mean it can never efficiently perform the functions it was supposed to, such as using advanced operating systems like Unix or running multiple programs with MS-DOS. As a result, it's mostly been used purely to make machines run faster, but in this role, and especially at the lowest price ranges, it can perform very well indeed.

The second type of chip is the 80386. This has been declared by IBM to be the chip on which the next generation of personal computing will be based; while this should be taken as the marketing propaganda it is, the chip is undoubtedly technically superior to the 80286 and will be able to run some very impressive software — once it's written. Already, there are programs that make use of some of its special properties, like VM/386 which lets you have as many 'virtual' MS-DOS computers running on your hardware as you have memory for; each virtual machine (hence VM) has its own window onscreen, its own CONFIG.SYS and AUTOEXEC.BAT and can be reset with CTRL-ALT-DEL independently of the rest.

The third type is the 80386-SX. This is,

internally, almost identical to the 80386, but is designed to be usable with less expensive peripherals, according to Intel, runs slower for a given clock rate and costs computer companies a lot less to buy. Perhaps a more believable reason why it has been produced is that Intel has licensed the 80286 design to many other chip makers, whereas it retains sole rights to the 80386 and SX; as a result of the pricing, machines with a 80386-SX in are directly competitive with those with 80286s. These Intel-based computers are slightly slower but can use all the current and future 80386 software — an important fact to bear in mind when deciding what to buy.

The fourth type, found in the very cheapest 386 computers, are the 16-bit 80386 chips. These are an older design of 80386 chips that have a bug in, and don't get some of their sums right — embarrassing in a computer. Unfortunately, without running a special test program, there's no way of telling from outside whether the chip inside a machine is good or flawed; fortunately, there's very little software that is affected. If you can look inside the computer, then the chip will be stamped '16-bit Software Only' if it's one of the early ones, or have the double-sigma stamp if it's new and fully featured. For all MS-DOS programs, the difference is not important, whereas the price difference may well be.

A final trick which some cheaper computers employ is to use a processor only guaranteed for one speed (like 16MHz), but run it at a faster rate. This is acceptable, provided that the manufacturer has individually tested each chip at the faster speed, since the chip makers always design in some leeway. But since it's difficult to guarantee this there's a risk that the computer's reliability is affected. The problems caused by this practice are also likely to crop up when the circuits heat up, after an extended period of use or when the outside temperature rises, so because a computer runs well in the showroom for five minutes is no guarantee of fault-free running.

Next to the processor speed in the league table of performance factors comes the disk speed. This has been getting faster as disk capacity has been getting bigger; while a good choice for your original PC two years ago might have been a 20Mbyte disk with a 60 millisecond access time (that's the average time, in thousandths of a second, to move to the right part of the disk to retrieve some data), now the minimum specification to aim for is 40Mbytes with 40, or preferably, 28 msec; it won't cost more than the old disk. There are a lot of the old sort still kicking about, and they tend to find their way into the very cheapest of the 80386 machines where they compromise the rest of the system.

In a similar way to the processor tricks, disks can be cached to speed them up. There are two sorts of disk cache; one uses an area of the computer's main memory to store disk reads and writes, and the other has special memory chips on the disk controller board

itself. The first is software only; it's commonly included with a machine as part of the bundle of programs that manufacturers or dealers include as a sweetener. Effectively costing nothing, it's a useful way to speed things up at the expense of some of your RAM and — occasionally — also causing compatibility problems.

On-board cache disk controllers are more effective, faster and don't cause compatibility problems. But they are more expensive, and as yet not common. If a computer has ESDI or SCSI disk interfaces (two general purpose ways of connecting a disk to the computer that are becoming more common on IBM standard machines), then it's more likely to have an on-board disk cache.

Memory, like hard disks, should be bought according to the maxim of as much and as fast as possible. Experience has shown, though, that whatever you have today is inadequate for next week's computational breakthrough, and the capabilities of the 80386 especially demand acres of speedy memory like a turbocharged Ferrari demands an Autobahn. So check on your machine's capability to accept more RAM. There are various different ways by which this can be achieved — some computers have no room for RAM on their main board whatsoever, but depend on memory on a special expansion board. This occupies a non-standard slot, and can generally hold up to 4Mbytes although such machines usually come with only 1 or 2 in situ. Upgrading these computers is simply a matter of buying more chips and plugging them in, although once the limit for the board's been reached a conventional memory expansion board will have to be used, and this takes up another slot.

Another option, which has fallen out of fashion somewhat, is that of filling every spare inch of the main board with RAM sockets. Here again, once the board is filled (and this usually happens after 2 or 4Mbytes) an expansion slot will have to be used to progress further. In place of this, the SIMMs (Single Inline Memory Modules) are gaining ground — these are miniature boards with eight or nine memory chips on them that snap into special holders. Each board can contain 256Kbytes, 1Mbyte, or (just coming onto the market) 4Mbytes. Since the boards mount vertically, they take up very little main board space and 8Mbytes can fit into the space that one occupied not so long ago. They tend to be more expensive than the equivalent memory in old-style (DIL, or Dual In Line) chips, but are easier to install or transfer from machine to machine.

One note of caution — some manufacturers eschew all of the above, and choose to limit memory expansion to their own special schemes at their own special prices. This isn't so common with smaller manufacturers; it's a liberty that the big boys are more fond of. Also, 80386 machines are at their best when used with 32-bit memory; the chips are the same, but they're arranged so that the 80386

can access 32 in one gulp. But 16-bit memory needs two bites, and this takes longer; extra memory is usually of the latter type, onboard or special-slot memory can be either. Check this.

Although MS-DOS is unable to use more than 640Kbytes of memory directly, anything over will be useful as cache, for programs that know how to use the extra (as most DTP and engineering programs do, these days) or as shadow RAM. This is a common trick employed in computers that come as standard with 1Mbyte of memory — normally, the built-in software (the BIOS) that knows how to drive the screen, keyboard, disks and so on lives in a ROM, or Read Only Memory, because this doesn't go away when the machine's switched off. Unfortunately, ROM chips are slower than RAM chips, and are also expensive to configure in 32-bit mode. With shadow RAM, the computer copies the contents of the ROM into spare RAM when everything's switched on, and things run faster.

When you get your new machine home, and wire up the plug (you've just spent umpteen thousand on the highest of high technology, but you still have to put a plug on), the problem of getting your current software and data across presents itself. One possibility is to use the MS-DOS BACKUP command to copy everything to floppy disks, and then RESTORE them onto the new system. This works, but is quite slow and won't work if you've got different versions of MS-DOS on the two machines; you can circumvent this by starting the second machine up with a floppy disk formatted as a system disk on the first, but it's still a fussy operation. Alternatively, many fast machines have room for a second hard disk inside; your dealer could install your original hard disk in the new computer, but that makes it difficult to sell the old computer.

Programs like LapLink connect the two micros together via the serial port, and let you copy files simply and quickly. If you're going to be using both machine regularly and sharing files, or plan to use the old machine as a backup store, it might be worth investigating a low-cost network. In any case, if you've got a much bigger hard disk in your new computer, think how you're going to back it up — some fast computers have tape streamer options, and you might be able to get a good deal if you specify this as part of the original package.

But in all these matters, a knowledgeable, honest dealer should be willing to help as part of the after-sales service. Competition is rife in the upgrade market, and you as an experienced buyer have considerable power. Combined with the considerable increases in computing technology that are pushing prices down almost monthly and the incipient explosion in 386-based power software, it all makes an exciting time to take the step into the next generation of personal computing. Perhaps that IBM marketing hype wasn't so wrong, after all.

NOW WE HAVE 80486
— AND PENTIUM.(50586)

YOUR 286/386: how perfect is up to you!

more than 100,000 combinations!

Just take one of our speedy mainboards and choose your case kit, floppy and hard disc (if any), video card and monitor, RAM size and any other accessories such as mouse, math chip etc. You don't have to pay for things you already have or do not need. Check the competition. If you find a comparable system at a better price, we would like to know, and may be we could improve our offer.

286/12 mainboard, fits all cases. Price £200

Intel 80286 CPU	socket for 80287	Norton SI 14
6/12.5MHz clock	G2 chipset	Landmark 16
RAM 512K-4MB	8 expansion slots	Award BIOS

286/20 mainboard, fits all cases. Price: £300

Harris 80286CPU	socket for 80287	Norton SI 19
8/10/16/20MHz	C&T NEAT set	Landmark 20
RAM 512K-8MB	8 expansion slots	AMI BIOS

386/SX, fits all cases. Price: £375

Intel 80386SX	80387SX socket	Norton SI 19
8/16MHz	Intel chipset	Landmark 20
RAM 512K-8MB	8 expansions slots	PHOENIX BIOS

386/20 (DX) mainboard, fits all cases. Price: £450

Intel 386DX CPU	80287 socket	Norton SI 22 max
16/20MHz clock	80387 socket	Landmark 26 max
Ram 1MB-8MB	C&T NEAT set	AMI BIOS

* Baby size board only 8 slots, sockets for only 8MB but can take RAM card.

386/25 (DX) mainboard, 2 sizes*. Price: £550

Intel 386DX CPU	80287 socket	Norton SI 28 max
20/25MHz clock	80387 socket	Landmark 34.5 mx
RAM 1MB-8MB	C&T NEAT set	AMI BIOS

* Big size fits only tower case.

386/25C mainboard, fits tower case. Price £1300

Intel 386DX CPU	80387 socket	Norton 35.2
Intel 385 cache	Weitek 3167 skt.	Landmark 43.5
RAM 4MB exp. to	16MB with card	AMI BIOS

386/33C mainboard, fits tower case. Price £2000

Intel 386DX CPU	80387 socket	Norton 46.5
Intel 385 cache	Weitek 3167 skt.	Landmark 57.5
RAM 4MB exp. to	16MB with card	AMI BIOS

*both have 8 slots and RAM sockets 4MB on board but can take 12MB RAM card.

The NEAT chip set can run at maximum speed if it has 2 banks of RAM by interleaving them. For that, you will need, 1, 4 or 8MB RAM on the 286/20 and the 386/SX but 2 or 8MB RAM on the 386/20 and /25(DX). The 386/25C and 386/33C do not have the same feature.

Solidisk
Technology Ltd,

Southend

(Head office)
17 Swayne Avenue,
Southend-on-Sea,
Essex SS2 6JQ
Tel: (0702) 354674
FAX (0702) 432343

Cambridge

28 Cambridge Road,
Milton, Cambridge
Cambs CB2 4AW
Tel: (0223) 440846

Sheffield

700 Attercliffe Road,
Sheffield
West Yorks S9 3RP
Tel: (0742) 441855

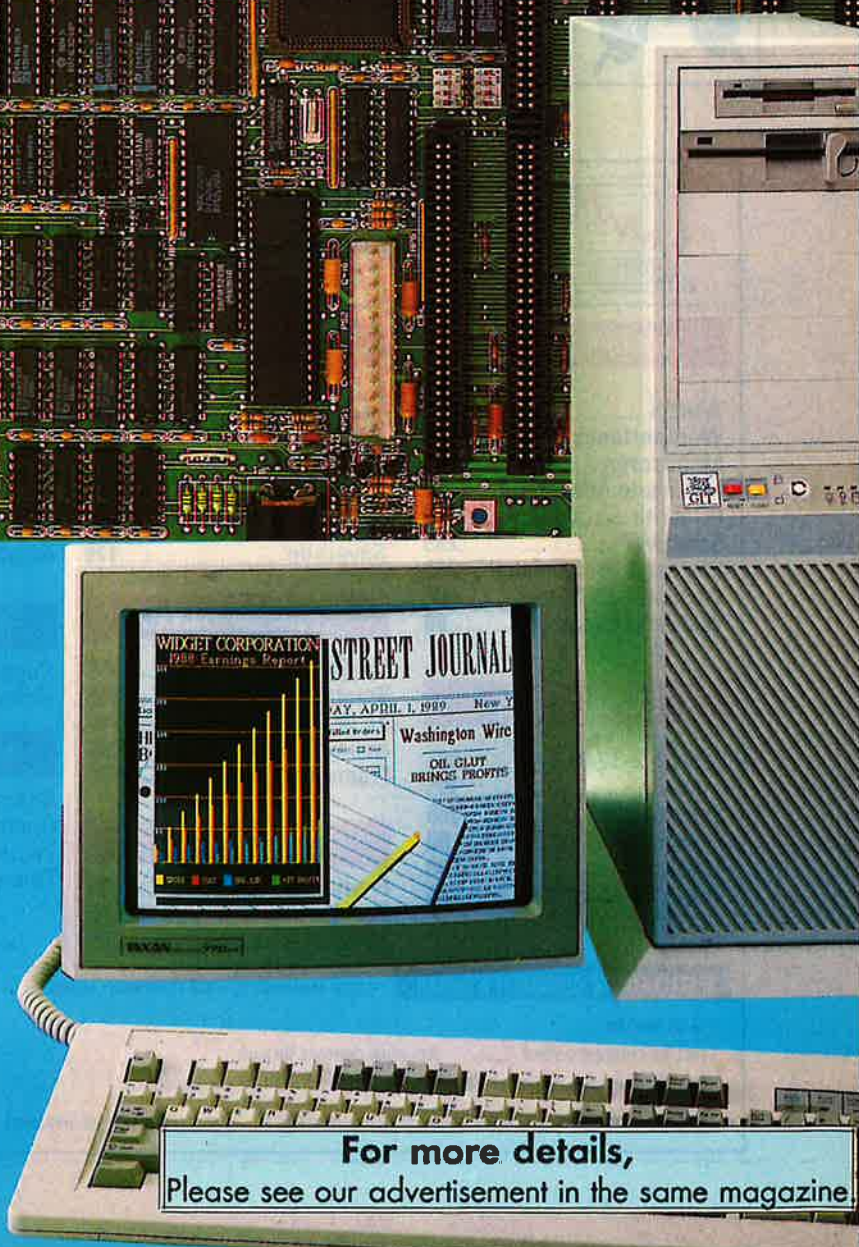
Lambourn

The Old Surgery,
28 Crowle Road,
Lambourn,
Berks
Tel: (0488) 71196

Dealer and volume discount available.

Branch manager required
for the following towns:
Manchester, Birmingham, Leeds,
Bristol, Southampton.

**If
You Want
The Best
Personal
Computer,
There's Only
One Choice**



**For more details,
Please see our advertisement in the same magazine.**



D:> ACCESS THE WORLD OF THE CD-ROM IMMEDIATELY !

Optech Ltd are a leading supplier in this fast growing market. More and more publishers are using the CD-ROM as a distribution media because of the large amount of data that they can store. The current range of titles we offer covers databases of postcodes and financial information to shareware and clip-art (all the images on this ad come from the Wheeler Quick Art CD-ROM. 2,200 images for £165)

If you would like further information on the range of CD-ROM drives or titles we stock please call or write to :

Optech Ltd
3 The Fairfield
Farnham
Surrey GU9 8AH
Tel: 0252-714340
Fax: 0252-711121

Feature CD-ROM

The World Factbook

This disc is a full-text search and retrieval product. It contains the Central Intelligence Agency's World Factbook. The Factbook is a yearly world almanac that delves deeply into the political, geographical and economic make up of all the countries in the world together with information on their population and communications. There is also a map of all 248 countries of the world in the .TIFF format to be incorporated into desktop publishing projects.

Part Number : 01.001.00

Price : £65

Delivery : Ex-Stock



PRIMETEK SYSTEMS

Computer System Specialists

TEL : (0582) 38006
 FAX: (0582) 452933
 TELEX: 826314

WORDPROCESSORS

Word 5	£395
Wordperfect 5	425
Manuscript	395
Multimate Advantage	495
PC Write	99
Smart WP	295
Wordstar Professional 5	399
Wordstar 2000 Plus	465
Wordstar Express	69

SPREADSHEETS

Lotus 1-2-3 2.01	395
Excel	395
Supercalc 5	396
Supercalc 3.21	69
Quattro	195
Smart Spreadsheet	395

DATABASES

DBase III Plus	£525
DBase IV	595
Super DB	245
Agenda	315
Retrieve IV	299
Silverado	179

INTEGRATED PACKAGES

Symphony 2	550
Smart	695
PC Works	145
Ability Plus	199
Framework III	550

PRESENTATION

Freelance Plus 3.0	395
Graphwriter II	395
Harvard Graphics	395

ACCOUNTING

Sage Accountant	£149
Sage Accountant Plus	199
Sage Bookkeeper	99
Sage Financial Controller	299
Sage Payroll 2	149
Amstrad Accountsmaster	149

DESKTOP PUBLISHING

Pagemaker 3.0	695
Ventura Publisher	795

INVESTMENT SOFTWARE

Sharemaster Plus	217
Opptionmaster	130
Technical Analyst	990
Teletext Updating System	256

All registered trademarks acknowledged.

IBM COMPATIBLES

Amstrad
 Opus
 Samsung
 Wyse
 Etc...Call for details

PRINTERS

Epson
 Star
 Brother
 Etc...Call for details

SERVICE

- Training courses available
- On-site maintenance available
- Call for brochures/demo discs/helpful advice/quotes

PRIORITY ORDER FORM

PLEASE REMEMBER TO STATE YOUR NAME, ADDRESS, TEL-NO, COMPUTER, DISC SIZE (5 1/4" 3 1/2")

PLEASE SEND ME

I ENCLOSE CHEQUE/P.O. FOR £

INCLUDING CARRIAGE THEN VAT

I WISH TO PAY BY VISA ACCESS PLEASE CHARGE TO MY ACCOUNT-MY CARD NUMBER IS

EXPIRY

SEND TO: PRIMETEK SYSTEMS LTD, DE LAPOUR HOUSE, 57 GUILDFORD ST, LUTON, BEDS LU1 2NL TEL 0582 38006



ALL REGISTERED TRADEMARKS ACKNOWLEDGED



Fast Bargains

GETTING YOUR HANDS ON THE POWER OF A 386 NEEDN'T BE RUINOUSLY EXPENSIVE. ANDY REDFERN LOOKS AT FOUR MACHINES OFFERING 386 PROCESSING AT A REASONABLE PRICE.

Both Intel and IBM are now committed to making the 386 the software standard. Intel's latest processor, the 80486, is backwardly compatible with the 386 and the next version of OS/2 will use 386 specific instructions. Intel has even promised that the processor of the year 2000 will still be compatible directly with the 386. This promise can be seen as an incentive for software houses to standardise on the 386 instruction set — a move that would provide applications with all the benefits of 32-bit processing, with none of the limitations of the 8086 or the 80286 processors.

In the light of these facts, it can come as no surprise that both the present and predicted rate of growth in this sector of the PC market is dramatic. But just as the

growth may be considered dramatic, the competition is now also very intense. The 386 market is beginning to split into two distinct sections — the high performance and high price machines and the lower priced, more conservatively specified machines. This article concentrates on the latter category.

One of the main factors in the pricing of a 386 machine is the speed of the main processor. The 80386 machine is now available in four different clock speeds — 16, 20, 25 and 33MHz. The speed at which the chip is run is proportional to the speed at which the applications run — the faster the chip, the faster programs execute. Of course, the faster the chip the more expensive it is. For this reason the

majority of cheaper 386 machines are based on the 16MHz or 20MHz versions of the processor.

One further element which was added to this equation of speed and price was the launch by Intel of a cut down version of the 386 chip — 80386SX. This chip is internally identical to the full 386 but has smaller data and address channels. The 80386 is a full 32-bit processor, both internally and externally, while the SX only has the external capacity to deal with 16 bits at a time. In practice this has two major effects — the chip is cheaper to buy but runs at about 75 per cent of the speed of the full 386 chip.

AMSTRAD

PC2386

Alan Sugar, the head of Amstrad, will probably want to forget 1989. The year started badly with chips being slow and erratic, even purchasing his own chip manufacturer only slightly improved his supply problem. Then rumours of a fault in the disk controller were confirmed in July when Sugar ordered all his 286 and 386 machines to be recalled, a process believed to have cost Amstrad £400,000. (Due to the crash in the Amstrad share price, it is calculated that Sugar himself lost £12 a second last year!)

The problem was with the hard disk controller. Amstrad had designed its own special controller that allowed slower and therefore cheaper hard disks to be used, without seriously affecting the performance. A rare but serious problem was found and Amstrad has now replaced its controller with a device bought from Western Digital.

The machine itself is impressive in its specification, providing a number of facilities as standard that other manufacturers in this sector of the market provide only as extras. Inside the unusual looking box (once likened to an inflated Apricot Xen machine) is a 20MHz 386 with 4Mbytes of RAM as standard. There is also a custom RAM cache controller which uses 64K of high speed memory. This cache allows the main 4Mbyte memory to be



made up of slower, less expensive chips without affecting the performance.

Of course standard PC applications cannot access the whole 4Mbytes of RAM directly so the machine comes with a LIM 4.0 expanded memory interface as standard. The other way of using the extra memory is by running 386 software, which will use the memory in extended mode. The only piece of 386 software

that comes with the machine is Windows/386. This allows the user to run multiple DOS applications in the extra memory.

One of the few drawbacks with the memory are the possibilities for expansion. The 4Mbytes of chips are held on four SIMMs (Single In-line Memory Modules) and to increase the memory size the four original SIMMs need to be replaced with higher specification devices.

This will then increase the RAM size to 16Mbytes — 4 or 16Mbytes are the only alternatives. Extra memory could be added through one of the five 16-bit expansion slots, but this would be slow memory as it would be neither cached nor able to be accessed as quickly as full 32-bit memory.

A range of four different monitors is available. They are all VGA and use the on-board Paradise VGA controller. Monitors go from a 12-inch mono to a 14-inch high resolution colour VGA display. Using a very small dot pitch, (the distance between the three phosphor dots which make up each individual colour), the screen has a feeling of a greater resolution than it has. I found this causes less strain on the eyes while working with the machine for long periods.

The machine comes as standard with a monitor, a mouse and a keyboard. It also has a 3½-inch 1.44Mbyte floppy disk drive on the left hand side of the case. The other 3½-inch drive bay next to it holds the 65Mbyte hard disk. On the right hand side of the box is a disk drive port which can support a 5¼-inch 360K or 1.2Mbyte drive or a 3½-inch 720K drive. Alongside the interface port is a power socket to enable the supplemental drive to be powered. Installing an extra drive is a task as simple as connecting the machine to a printer.

The back of the machine holds the bi-directional parallel, serial and video ports. On the left of the box is a mouse port which the Microsoft compatible mouse connects to. This makes using it a little bit difficult for all but the left handed (is this a piece of Amstrad positive discrimination?) as the cable tends to get snagged on the keyboard. The keyboard itself is a dramatic improvement over previous Amstrad machines. It provides the usual AT layout containing 102 keys. A security lock is provided on the case which disables the keyboard. MS-DOS versions 3.3 or 4.0 are available along with Windows/386 and a number of useful machine specific utilities.

This machine represents excellent value for money providing as standard many often expensive extras.

COMPUADD 386/16

The journey of a computer from the manufacturer to the customer may take it through at least one middle company, but more usually two before it arrives at its final location. The manufacturer, the distributor, and the dealer will all take their cut from the final price. The removal of both the dealer and distributor



would therefore seem beneficial to both the manufacturer and the end user alike. Between them they can split the dealer and distributor profits in greater manufacturing profit and lower customer price.

This concept of computer marketing coupled with mail order distribution was first tried in the US. One of the most successful organisations, Dell Computers, launched itself onto an unsuspecting UK market in 1987. Its success encouraged the other big direct sales company in the US — CompuAdd — to follow Dell's lead. After a year of effort it is now beginning to reap the rewards. Being second into the UK has cost it dearly in publicity terms, but CompuAdd is pushing hard to make up for it, by simply offering an excellent package that includes the machine and an on-site maintenance agreement.

CompuAdd is set to launch a new range of machines in the next few weeks, but a more accurate conclusion of the performance it offers can be drawn from the machine I have had under long term test for the last year.

The CompuAdd 386/16 as the name suggests is a 16MHz 80386 based computer. It comes with a variety of hardware extras, the majority of which are third party products for which CompuAdd is a dealer. The base machine checks in at just under £2000. This model comes with a 5¼-inch or 3½-inch floppy disk and a 44Mbyte Miniscribe hard disk. The spare drive bay on the review machine was filled with a second floppy disk. The video card is a Hercules monochrome graphics adaptor and is shipped with a standard 14-inch amber monitor. EGA and VGA are available as extras and are supplied with a Philips EGA or analog monitor.

The machine is large in dimensions and would be better suited to an under-the-desk position. The back of the machine provides access to the eight expansion slots. Only five of these slots are free as

the hard disk controller, the video board and the parallel and serial port controller card each require a slot.

Far more important than the exact specifications of the machine is a feature that has become a hallmark of mail order PC manufacturers — hotline and on-site support. A 386 machine is a powerful and complex computer. Many new or inexperienced users may find difficulty in setting it up to meet their exact requirements. Both Dell and CompuAdd provide one year of free, unlimited support to enable you to solve those mysterious problems. When buying a new system, this is a feature whose value is difficult to calculate in pounds but can be the difference between £2000 worth of computer working for you or against you.

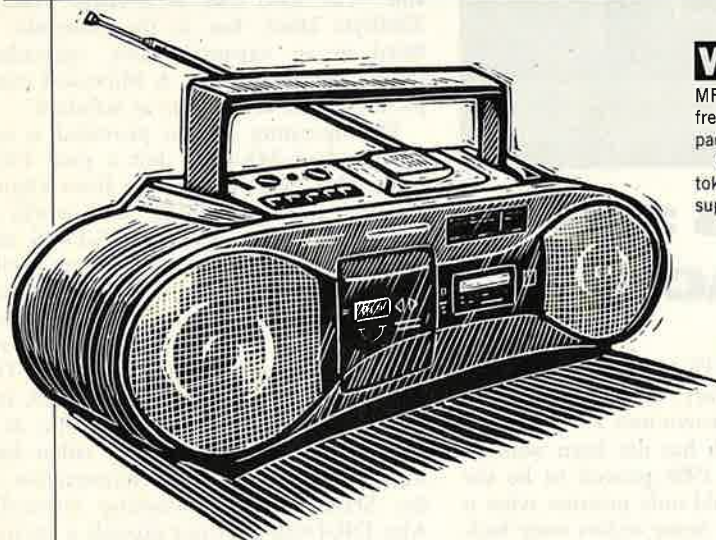
In the 12 months I've used this machine, few problems have been noticed. The few difficulties I had were swiftly dealt with by the technical support line and left me in no doubt that if something more serious had occurred they would have been able to help. The performance of the machine is about average for its class, and would be better likened to a shire horse than a Derby winner.



DIGITASK AXIOM 386/20

Digitask first gained notoriety through the low prices it advertised in various magazines. As the company grew it moved away from simply selling reduced price add-in cards and peripheral devices, and diverted some of its energies into producing its own machine from the components that it bought in. The product of that development is the Axiom range of PCs.

To make the world's best floppy disk even better, we've given it some extra bits.



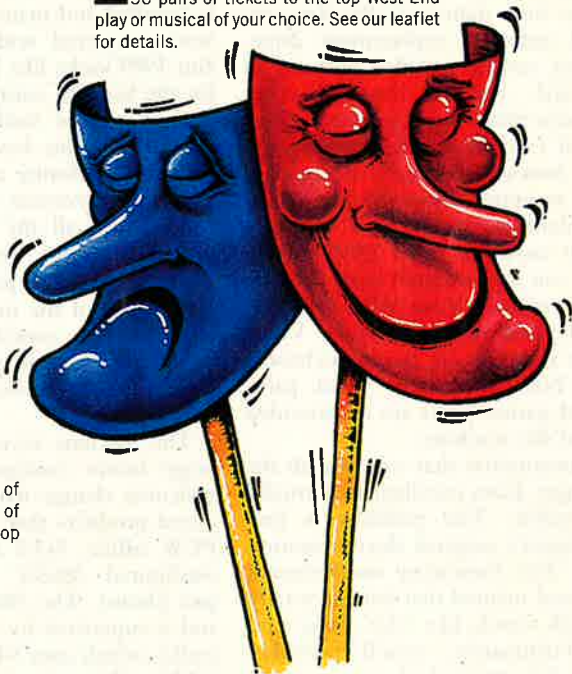
Collect 150 tokens and proofs of purchase for this brilliant Sanyo portable CD system, 75 tokens for a Sharp stereo radio cassette, or only 25 tokens for a Toshiba personal stereo.

With every box of 3½" disks (MF2DD or MF2HD) you'll receive a free disk in its own compact safety case.

Collect the on pack tokens for a range of superb free items.



Enter our free prize draw and win one of 50 pairs of tickets to the top West End play or musical of your choice. See our leaflet for details.



Collect 10 tokens and proofs of purchase for the top 40 CD of your choice, or five tokens for a top 40 LP or cassette.

For a leaflet giving more details of the Autumn 1989 TDK floppy disk promotion, please contact your dealer or TDK on 0737 773773. Offer open until 31.12.89.

After testing 2,500 3½" disks from leading brands, the 1988 Memcom Report placed the TDK MF2DD in overall first position.

TDK

The 386 machine comes not only in a number of different hardware configurations, but also in a number of different boxes. The machine we concentrate on here is the mini-tower machine, but the majority of comments especially about machine performance and the internal architecture apply to the desktop and full size tower systems as well.

The heart of the machine is the ELT-386 motherboard. This features a 20MHz 386 and a socket, in this case filled, for the 387 maths co-processor. The 20MHz 387 co-processor is not cheap and so the manufacturers have also included a socket for the much cheaper, but slower, 80287 chip. Only one of the maths chips can be installed at any one time, so don't be misled into thinking that having both will make the machine even faster.

With 4Mbytes of RAM installed as standard, even the hungriest of DOS applications should be satisfied. OS/2 will run at a pinch, but you'll probably need to double the amount of RAM if you intend to run Unix. There is no memory cache technology employed; instead the 4Mbytes is made up completely of 80ns fast RAM. Although this is an expensive, brute force technique the performance was reasonable.

The machine has a 1.2Mbyte 5¼-inch floppy disk drive and an optional extra 3½-inch drive or a tape streamer. The tape streamer allows a mirror image of the hard disk to be saved to tape. If the hard disk is then damaged, the data can be restored onto the replacement drive. The streamer can be installed without an interface card, driving the device as though it were drive B:. If you need drive B:, a special expansion card can be used to drive it instead. The tape streamer is available as an optional extra at just £199.

The standard hard disk is a 40Mbyte Hitachi, but anything from 20Mbytes to 122Mbytes can be installed instead. The fitted video card is a Vega VGA made by Headland Technology (previously Video Seven). The monitor can be monochrome or a colour NEC Multisync. Serial, parallel and IBM games ports are all provided at the rear of the machine.

The documentation that comes with the machine ranges from excellent to virtually incomprehensible. The problem is that each component's original documentation is supplied. The Taiwanese motherboard has a translated manual that left me totally confused with words like 'clor', 'reis' and 'prechag'. Fortunately, you'll probably never need this manual if you use the machine in the configuration it's delivered in, but an overall introductory user guide would have been helpful.

Considering the diverse origins of all the components that fill this machine, it all works together as one would expect.

The machine is robustly built and in either its tower or mini-tower configurations leaves ample room for expansion.



NTS 386 CACHE

NTS has expanded rapidly in its short history. From a small dedicated staff it has grown into a well known PLC. This growth has not been without its problems and 1988 proved to be the year that NTS could only promise what it wanted to deliver. Some orders were badly handled and many customer complaints were answered with a certain tardiness. But 1989 looks like being a far better year for the Scottish company.

A change of staff and a refocusing of the product line have led to a clearer vision for the future and for the customer. The latest version of the 386 machine comes with all the refinements and improvements one would expect from a second generation product. Also the standardisation of the models has led to greater customer confidence that what you order is what you get. (Could you spot the difference between a 28ms and 42ms hard disk?)

The machine reviewed is available in a beige tower configuration that makes a welcome change from the IBM grey coloured products that so regularly enter the PCW office. NTS also sells a similarly-configured 386SX mini-tower machine (see photo). The 386 clocks in at 20MHz and is supported by a memory cache controller which uses 64Kbytes of high speed RAM. Although the machine only provides 1Mbyte of RAM as standard, this can be expanded up to 8Mbytes on the main motherboard. A LIM 4.0 expanded memory controller is also provided.

The back of the machine contains a wealth of ports and expansion slots. Two

parallel, two serial and one mouse interface are provided as standard. Further hardware additions can be made via the five free expansion slots. Unusually the controller for the ports is on the main board so the ports themselves are actually located well above expansion slots. This is a definite bonus on a tower machine as reaching the lower end of the back is virtually impossible once the machine is installed.

The review machine was supplied with a VGA board and Packard-Bell colour monitor. Hercules monochrome and VGA monochrome options are also available. The hard disk is a fairly average 32Mbyte affair, but as the controller is fitted in an expansion slot, upgrading should not be difficult. A Microsoft compatible mouse also comes as standard.

The operating system provided is not the standard MS-DOS but a rival DOS compatible operating system from Digital Research called DR-DOS. This works in exactly the same way as MS-DOS and provides a number of useful extra facilities. The version that I tried had a number of problems using the SHARE command. This is a facility that is often required if you are using a network. The problems have supposedly been fixed, but if you want to use your machine as a network file server, I would either buy MS-DOS or demand a demonstration of the SHARE utility working correctly. Also DR-DOS does not provide a version of GW-Basic.

Like the CompuAdd it comes with an on-site maintenance contract, but it is limited to six months while telephone support continues for a full year. The maintenance contract is provided by a third party and it can be extended if you feel you need the continuing support.

NTS certainly appears to have improved its customer relations and has endeavoured to solve some of its operating difficulties. The machine is robust and well engineered. If the Amstrad provides too many facilities, this would be a good choice.

Conclusion

If you need a fully configured machine with the optional extras, then Amstrad is an excellent buy as all the extras are included in the base machine. But the extras although included in the price aren't free. If you don't need them now there is no point in buying them. RAM and extra hard disk capacity can be added at a later stage, and with prices falling as they currently are, buying later could get you a better deal. If you need support then the CompuAdd or the NTS should help you through difficult days, while if you're a fairly experienced user the Digitask should prove to be a solid performer.



DAN TECHNOLOGY SYSTEMS

315 CROWN HOUSE, NORTH CIRCULAR ROAD LONDON NW10 7PN

TEL: 01-961 6959 FAX: 01-963 0034

COM-10 386-33MHZ 32K CACHE SYSTEM... £2159.00

- ★ 33MHZ Main Board 32K Cache Memory Award Bios, 32K static ram cache
- ★ 1MB of Ram
- ★ 200W Power Supply
- ★ Small Footprint Case
- ★ 102 UK Keyboard
- ★ 1.2 Drive
- ★ Hard & Floppy Disk Controller
- ★ Serial/Parallel Card

	12"	14"	14"
	Mono	EGA	VGA
20MB (65ms)	2376	2616	2675
40MB (65ms)	2427	2667	2726
40MB (28ms)	2485	2725	2784
70MB (28ms)	2659	2899	2958

ADD £126.00 for 2MB
ADD £360.00 for 4MB
ADD £828.00 for 8MB
Landmark: 58.7

COM-1 386-20MHZ 64K CACHE SYSTEM ... £1277.00

- ★ 20MHZ Main Board 64K Cache Memory 128K Ami bios, 64K static ram cache Shadow ram
- ★ 2MB Ram Card
- ★ 1MB of Ram
- ★ 200W Power Supply
- ★ Small Footprint Case
- ★ 102 UK Keyboard
- ★ 1.2 Drive
- ★ Hard & Floppy Disk Controller
- ★ Serial/Parallel Card

	12"	14"	14"
	Mono	EGA	VGA
20MB (65ms)	1487	1727	1773
40MB (65ms)	1545	1785	1831
40MB (28ms)	1618	1858	1904
70MB (28ms)	1777	2017	2063

ALSO AVAILABLE WITH 8MB RAM CARD
ADD £144.00 for 2MB
ADD £288.00 for 4MB
ADD £720.00 for 8MB
Landmark: 30.1

COM-9 386-20MHZ SYSTEM ... £1012.00

- ★ 20MHZ Main Board Page Interleaved Memory Phoenix bios, shadow ram for system & video bios
- ★ 1MB of Ram (expandable to 8MB)
- ★ 200W Power Supply
- ★ Small Footprint Case
- ★ 102 UK Keyboard
- ★ 1.2 Drive
- ★ Hard & Floppy Disk Controller
- ★ Serial/Parallel Card

	12"	14"	14"
	Mono	EGA	VGA
20MB (65ms)	1229	1469	1528
40MB (65ms)	1280	1520	1579
40MB (28ms)	1338	1578	1637
70MB (28ms)	1512	1752	1811

ADD £126.00 for 2MB
ADD £360.00 for 4MB
ADD £828.00 for 8MB
Landmark: 25.5

COM-8 386SX-16MHZ SYSTEM ... £775.00

- ★ 16MHZ Main Board Page Interleaved Memory AMI BIOS, shadow ram for system & video bios
- ★ 1MB of Ram (expandable to 8MB)
- ★ 200W Power Supply
- ★ Small Footprint Case
- ★ 102 UK Keyboard
- ★ 1.2 Drive
- ★ Hard & Floppy Disk Controller
- ★ Serial/Parallel Card

	12"	14"	14"
	Mono	EGA	VGA
20MB (65ms)	992	1230	1291
40MB (65ms)	1043	1283	1342
40MB (28ms)	1101	1341	1400
70MB (28ms)	1275	1515	1574

ADD £126.00 for 2MB
ADD £360.00 for 4MB
ADD £828.00 for 8MB
Landmark: 19.6

COM-7 286-20MHZ AT SYSTEM ... £730.00

- ★ 20MHZ Main Board 80286-16 microprocessor, Phoenix bios Ems LIM 4.0 on board, NEAT chip set, Clock calender
- ★ 1MB Ram on Board (expandable to 8MB)
- ★ 200W Power Supply
- ★ Small Footprint Case
- ★ 102 UK Keyboard
- ★ 1.2 Drive
- ★ Hard & Floppy Disk Controller
- ★ Serial/Parallel Card

	12"	14"	14"
	Mono	EGA	VGA
20MB (65ms)	947	1187	1246
40MB (65ms)	998	1238	1297
40MB (28ms)	1056	1296	1355
70MB (28ms)	1230	1470	1529

ADD £126.00 for 2MB
ADD £360.00 for 4MB
ADD £828.00 for 8MB
Landmark: 26

COM-4 286-12MHZ AT SYSTEM ... £537.00

- ★ 12MHZ Main Board 80286-12 microprocessor, Ami bios Ems on board, Suntac chip set, Clock calender
- ★ 640K 100NS Ram on Board (expandable to 4MB)
- ★ 200W Power Supply
- ★ Small Footprint Case
- ★ 102 UK Keyboard
- ★ 1.2 Drive
- ★ Hard & Floppy Disk Controller
- ★ Serial/Parallel Card

	12"	14"	14"
	Mono	EGA	VGA
20MB (65ms)	747	987	1033
40MB (65ms)	805	1045	1091
40MB (28ms)	878	1118	1164
70MB (28ms)	1037	1277	1323

ADD £50.00 for 1MB
ADD £108.00 for 2MB
ADD £324.00 for 4MB
Landmark: 16.1

COM-2 286-10MHZ AT SYSTEM ... £499.00

- ★ 10MHZ Main Board 80286-10 microprocessor, Ami bios VLSI chipset, Clock calender
- ★ 640K 120NS Ram on Board (expandable to 4MB)
- ★ 200W Power Supply
- ★ Small Footprint Case
- ★ 102 UK Keyboard
- ★ 1.2 Drive
- ★ Hard & Floppy Disk Controller
- ★ Serial/Parallel Card

	12"	14"	14"
	Mono	EGA	VGA
20MB (65ms)	716	956	1015
40MB (65ms)	767	1007	1066
40MB (28ms)	825	1065	1124
70MB (28ms)	999	1239	1298

ADD £50.00 for 1MB
ADD £108.00 for 2MB
ADD £324.00 for 4MB
Landmark: 13

ADD ONS WITH THE PURCHASE OF A SYSTEM

3.5" 720K Floppy Drive.....	£54.00
3.5" 1.44MB Floppy Drive.....	£60.00
5.25" 1.2MB Floppy Drive.....	£53.00
DOS 4.00.....	£46.00
MICROSOFT WORKS integrated.....	
application.....	£46.00
GM6+ Microsoft compatible Mouse.....	
.....	£30.00
Monitor and keyboard extension.....	
lead.....	£30.00
14" black & white monitor.....	£68.00
Second serial port.....	£ 8.50
Extra for Full size case.....	£16.00
Extra for Mini tower case.....	£19.00
Extra for Full tower case.....	£59.00

ALL PRICES ARE EXCLUDING VAT. DELIVERY FOR ONE SYSTEM IS £10.00

14 DAY MONEY BACK GUARANTEE IF NOT SATISFIED. ALL SYSTEMS HAVE A ONE YEAR BACK TO BASE GUARANTEE, FAST TURN AROUND SERVICE.

All sales are subject to DAN TECHNOLOGY LTD. terms and conditions

PLEASE CALL FOR DETAILED PRICE LIST AND SPECIFICATION

Built-in reliability a built-in 3 year

3 YEAR Guarantee

BACKED BY TCL

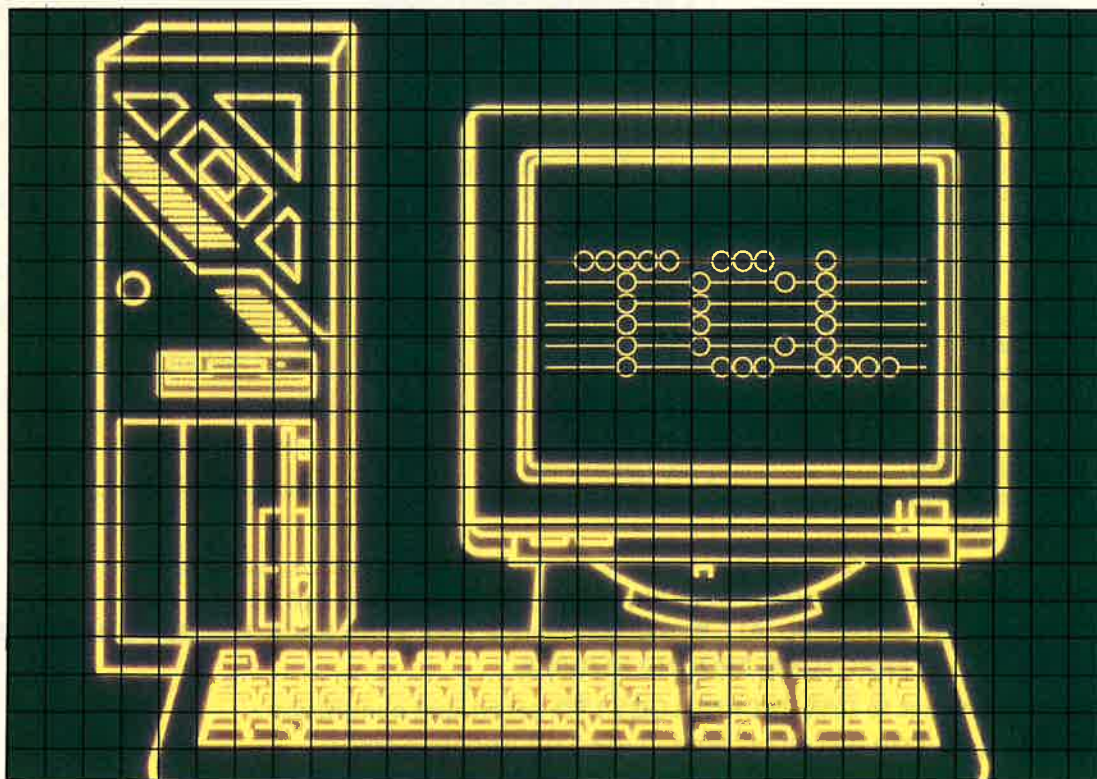
- + Full ON SITE maintenance, wherever you are.
- + 8 hour call out gets you back in business quickly.
- + Working late, working weekends, we're there when you need us.
- + Comprehensive guarantee covers parts AND labour.
- + Backed by TCL—a powerful reputation to rely on.
- + Optional extended cover for years 2 and 3 for ½ usual price.

That's the built-in bonus only from TCL

At TCL, we use only the finest big name components. And we design our computers to ensure these proven quality parts function comfortably within their limits. A 72 hour burn-in period gives TCL computers built-in reliability. The kind of reliability a major name like TCL demands and is prepared to back for 3 full years.

**YOU WON'T FIND A BETTER MACHINE WITH
THESE FEATURES AND THIS RELIABILITY—ANYWHERE—
AT ANY PRICE!**

XT, AT, 386—there's a TCL computer that offers the kind of performance you're looking for, at a price that makes sense. And because it's a TCL computer it will go on performing solidly, reliably, year after year.



CHECK THE FEATURES

You'll find a TCL computer with the power to meet even your most demanding expectations.

- Additional 3½" 1.4mb floppy disc gives additional storage flexibility.
- Advanced 14" monitors give you the option of mono (720 x 348 resolution), CGA (300 x 200), EGA (640 x 340), or VGA (800 x 600). Naturally they all feature tilt and swivel base and have paper white monitors with inverse video.
- 4 main disc drive ports give you the flexibility to specify the mix of hard and floppy discs that suit you best.
- 5¼" floppy disc drive in your choice of XT (360k), AT (1.2mb), or 386 (1.2mb).
- Hard disc drives offer performance from 20mb right up to 338mb.
- Latest IBM format keyboard has full LED indicators, dual positioning, and a large return key for the most comfortable use.
- Solid metal case is coated in safe anti-radiational zinc, and includes keyboard lock, reset and turbo switches, and speed display.
- System is easy to expand using full length AT style cards.

ability plus ar guarantee!

BACKED BY
TCL
First Year Free

Flat or stack – the choice is yours.

FREE MS-DOS OPERATING SYSTEM WITH EVERY MACHINE



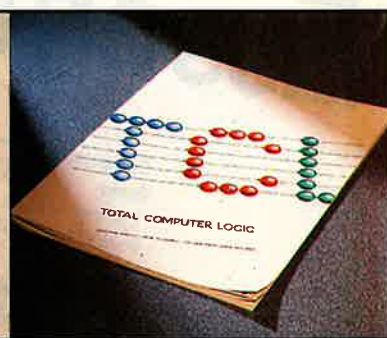
XT-10 MHZ-640K RAM. AT-12MHZ-1MB RAM. 386-20MHZ-2MB RAM.

YOU WANT POWER
YOU NEED RELIABILITY
YOU DEMAND VALUE

Check out performance, check out the price—it's impressive.
And with the backing of TCL maintenance package,
it's unbeatable!

FREE!
BROCHURE

Get the full story on
the TCL range, from technical
specifications and
options, to prices and back-
up service details.



LET'S TALK COMPUTERS

FREEPHONE

WE'VE PAID FOR YOUR CALL!

0800 838 345

The full TCL story is only a FREE
PHONE CALL away – and we'll send
our free BROCHURE. Or better
still, let's talk about your
order and our 7 day
delivery service.



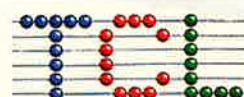
**FREEPOST NO STAMP
NEEDED**

We've paid the postage! It's easy to send for your copy of the TCL brochure. Return
the coupon in an envelope marked FREEPOST to our address.

NAME _____

ADDRESS _____

POSTCODE _____ TELEPHONE _____



13, NAPIER SQUARE, HOUSTON INDUSTRIAL ESTATE, LIVINGSTON, EH54 5BR. TEL: 0506 31288.
FAX: 0506 30258

RAFFIN COMPUTERS

NEW AND USED EQUIPMENT AVAILABLE EX STOCK

WE BUY SURPLUS AND REDUNDANT STOCK PS2 AVAILABLE PRINTERS

Brother, Cih, Epson,
IBM, OKI.

TERMINALS

Memorex, Wyse.

DISK DRIVES (HARD AND FLOPPY)

Rodime, Seagate Miniscribe, CDC, Tandon,
Shugart, Syquest.

ALL AVAILABLE AT VERY COMPETITIVE PRICES

ALL ITEMS SECOND USER UNLESS OTHERWISE STATED

TEL: 0672-62499

FAX: 0672 63929

SPRINT

FAST INTERNAL HARD DISK DRIVE FOR THE AMSTRAD PPC

New backlit
screen
upgrade — £199



SEE US ON
STAND 2339
at the Personal
Computer Show

SPRINT — High performance 20MB or 40MB Hard Disk Drive

- 27 msec Average Seek Time
- 880kb/sec Sustained Data Transfer Rate
- Up to 7 times the power of an 'XT'
- 8kb Disk cache

SPRINT — Lightweight and Integral

- Internally mounted in the Amstrad PPC
- Replaces second Floppy Disk Drive
- Adds less than 70 grammes

SPRINT — High Data Integrity

- Automatic Error Detection and Correction
- Autoparking heads
- Withstands a 10G shock during operation and 75G in transportation

The PPC SPRINT stands in a class of its own for cost-effective Price/Performance.

20MB SPRINT Upgrade £549

40MB SPRINT Upgrade £699

PPC 640 including 20MB SPRINT £1049

PPC 640 including 40MB SPRINT £1199

A wide range of PPC Enhancement Products are also available, please call for details. PRICES EXCLUDE CARRIAGE AND VAT

Stratum Technology Limited

109a Crockhamwell Road,
Woodley, Reading RG5 3JP
Telephone (0734) 441236
Fax (0734) 441257

Persuasion, FileMaker, Volkeswriter, AGENT, Q&A, R:Base, Lotus, MultiPlan, Open, Access, Samna, Symphony, WordStar, MultiPlan, WordPerfect, Lotus 1-2-3, Symphony, WordStar, EXCEL, Basic, Project Manager, FrameWork, Word, Dataease, dBASE, Paradox, Enable TK! Solver, Typing Tutor, jazz, PageMaker, Ventura, Word, Dataease, dBASE, Paradox, SuperCalc, OS/2, CP/M, DisplayWrite, Netware, DOS, HyperCard.

Essential PC Training

Computer
Based
Training
from £39.00-£165.00



Video
Training
from £39.95-£295.00



Instructor
Led
Courseware
from £26.00-£595.00



Guaranteed effectiveness

- **Reduce Training costs.** Train any number of people with one overall investment.
- **Save time.** Reduce the disruption of staff attending outside Training Courses. Avoid struggling with those manuals.
- **Increase flexibility.** Train when and where you want. It's available for constant review.
- **Guaranteed Quality.** How many Training Courses offer money-back guarantees? We do.

- **Training for over 100 Software Products.** IBM compatible and Macintosh.
- **Teach Yourself and Instructor led materials.** Introductory, Intermediate and Advanced Training.
- **Total Support.** Free evaluations, technical support and independent advice. Life-time product warranty. Free or low cost upgrades.
- **Volume discounts.** 99% of orders shipped same day. LAN licences. Site licences. Re-seller programmes.

Unequalled service

Office Associates Ltd
The Old Rectory
South Willingham
Lincoln LN3 6NG

Telephone (050781) 501
Facsimile (050781) 332



OFFICE
ASSOCIATES

ADVANCED TRAINING FOR EXPERIENCED USERS
G I N N R D N V P I S R S N E D I O N L B O L Y A M L S T S V E H T

PHONE FOR INDEPENDENT ADVICE ON YOUR TRAINING NEEDS



Economy Power

RUMOURS OF THE 80286 CHIP'S DEATH ARE GREATLY EXAGGERATED. THERE ARE NOW SOME FAST AND CAPABLE MACHINES BASED ON THIS PROCESSOR AS RUPERT GOODWINS DISCOVERS.

Flying in the face of fashion sometimes makes good business sense. While those enamoured of technology for technology's sake are busily promoting the 80386 chip as the powerhouse of the future — and with good reason — those who need good performance and good value now can profitably look elsewhere.

The 80286, although no longer the flagship of PC technology, has found a niche where its faster speed and lower cost can be put to good advantage. A 20MHz 286 machine can outperform a 16MHz 386, while more than matching it feature for feature; and where the astute buyer can really score is with the many bundled goodies that are often thrown in to make the comparison even more loaded: mice, windowing systems, even complete suites of application programs, come with computers that, by themselves, are good business value.

Another area where 80286 designs are arguably on a par, if not better than, the latter offerings is in the rest of the computer circuitry. For more than four years, the 80286 was the chip at the heart of IBM's premier personal computer, the AT, and during this time there was fierce

competition among rival companies to produce lower-cost alternatives. As a result, the chip manufacturers produced two or three chip sets that duplicated the functions of the IBM design; by now, it's possible to produce a very powerful machine that out-performs the IBM original while being inherently more reliable.

This reduction in complexity and cost has also resulted in a reduction in size. For those with little space, or an eye for style, the slim, small-footprint 286 computers are more attractive than the power user slabs of the 80386 towers or desktop monoliths. Peripherals, too, are still optimised for the AT standard rather than the newer computers; the fastest network cards, disk interfaces and video adaptors work just as well with AT compatibles as with more modern micros. In some ways, this is because the AT saw the last universal standard for expansion; since then, the market has become fragmented and confused as IBM takes a different tack from the rest of the computer world and designers wait until a clear direction becomes apparent. Meanwhile, the 286 standard benefits.

The 80286 combines high performance computing with the advantage of a ma-

ture technology. The downsides of choosing such a computer lie in the future; the 80386 has great potential for multi-user systems, where many people can use the same computer, and for multi-tasking applications, where one person uses one computer to do more than one thing simultaneously. There are many ways to persuade the 80286 to manage both of these tasks, and if you're intent on sharing your machine between word processing, communications and spreadsheets then you can buy software that will manage all this and more. New packages, like Lotus 1-2-3 release 3, and IBM's OS/2 operating systems, still works with the 80286 as well as with the 80386, so you won't be missing out on too much just yet.

Perhaps the final point in the 286's favour is the range of choice available to the buyer. No PC company lacks a high-performance AT compatible; indeed, commercial pressure caused IBM itself to re-introduce just such a computer (the Model 30-286) after dropping the design for a while. For those with a yen for portable power, the 286 standard is even more pre-eminent, and this is another indication of the active role that such computers will continue to play.

HI-GRADE 286-20

Hi-Grade is typical of a certain breed of computer company; while the hardware is imported from the Far East, a close eye is kept on quality control and suitability of any particular combination of features for the UK market. As a result, Hi-Grade's got an enviable reputation for good, solid products at a reasonable price; its top-of-the-range 80286 box shows these features well.

The case is small; only 37 centimetres wide by 41 deep and 16 tall. Within this diminutive space sits a full complement of storage and interface devices; the review machine came with 3½-inch and 5¼-inch floppy disk drives, a 40Mb, 25ms hard drive, and connections for two serial and one parallel device.

One of the serial ports is already spoken for, and is intended for use with the Microsoft Mouse that's provided, along with the obligatory copy of Micro-



soft Windows and MS-DOS 4.01. That's the version with most of the early problems removed; both of these are full Microsoft versions with extensive manuals, tutorials and a couple of applications programs thrown in. A copy of Ashton-Tate's Framework also fell out of the

large box of software; this is an all-in-one 'productivity package' that, if you're not concerned with running the same software as someone else, provides almost all of the normal functions that you bought the computer for. All this results in a computer system that can be used from the hour it's unpacked; the review machine came with Windows et al ready installed, which takes a lot of the pain out of getting useful work from an expensive purchase.

The rest of the hardware is similarly no-nonsense; an NEC Multisync monitor complements a 16-bit VGA card from Paradise. This comes with software to enable it to work with popular packages such as AutoCAD, Lotus 1-2-3, Ventura and so on, and its 16-bittedness makes it many times faster than the VGA design found in the original IBM PS/2 series. It can also manage pictures up to 800 by 600 pixels in 16 colours; a performance which is more than good enough for prolonged DTP work.

The front panel of the Hi-Grade is prettier than most, due in large part to the

marketing decision to equip every port with its own light. So, every time the computer uses one of the serial ports to talk to a modem, for example, a light shines to confirm the fact. The same is true for either printer port; whether you consider the annoying, enlightening of enervating is a matter of personal taste. More useful — slightly — is the small green display of the clock speed of the processor. Normally running at 20MHz, this can be switched down to a slower speed if a program has problems at full tilt. A button provides this feature, this is situated next to a Reset switch that stops anything from running at any speed. The front panel is finished with a twee barrel lock that disables the keyboard.

Inside, the motherboard is a fine example of current technology. Based around the American company Chips And Technology's (CHIPS) 80286 support circuitry, with a smattering of postage-stamp sized odd-job chips, it provides eight expansion slots, and room for up to 8Mbytes of RAM in SIMM sockets. The former are half-occupied by two option cards (for printer, joystick and serial ports), the aforementioned VGA adaptor and a western Digital (like CHIPS, a famous name that guarantees compatibility for a number of clones) hard/floppy disk controller card. Since WD now owns Paradise, it's a good bet that Hi-Grade buys the last two cards from the same source; another canny bit of business that keeps the price down.

The SIMM sockets are almost the only aspect of the computer that raise a reviewer's eyebrows. Instead of the near-universal clip-in edge connector style, these have a pin and hole system — exactly like a normal RAM chip socket sawed in half — that accept memory SIMMs unlike any I've seen before. While these appear slightly cheaper to produce than the normal kind, they must be more difficult to get hold of, and some confusion might arise in a year's time if you go to anyone other than Hi-Grade for an upgrade.

The other problematical aspect of the system is the documentation, which consists of a plastic bag stuffed to bursting with the manufacturer's documents for the various components of the system. Everything's there, but a neophyte user would have big problems in diagnosing a fault or changing a setting. So make sure there's plenty of support to hand.

Apart from this, the Hi-Grade option is an exemplary design where good business sense is combined with solid engineering and few cut corners. Even if logistics demand that you buy from somewhere else, the standard of quality embodied herein is a good yardstick against which to judge other offerings.



TULIP AT COMPACT 2

Tulip has long been keen on making an impact in the lucrative UK computer market; several worthy efforts in the past has kept it in the game but without putting it amongst the ranks of Compaq or Amstrad.

As the name suggests, the company hails from the Netherlands, and like most European manufacturers maintains its own design department. Unlike most, Tulip writes its own BIOS software; this means that any discrepancies between the way its computers work and the IBM originals can be fixed by someone two hundred, as opposed to four thousand, miles away.

The main Tulip contender in the high-performance AT stakes is the AT Compact 2. At 30 x 38cm, the box is one of the smaller designs, and economical with desk space. Inside, the usual 3½-inch and/or 5¼-inch floppies nestle up against a 45Mbyte hard drive; some intrepid shoehorning has resulted in a fairly large main circuit board lying mostly hidden beneath the drive cage. This makes repair or upgrade a little difficult, although this last is a bit problematical since the board can only accept the memory it comes with — 1Mbyte — and there are no spare sockets or SIMM connectors for further expansion.

Any more memory required will have to plug in on an expansion board, taking up one of the three spare slots provided. The other two out of the five total hold another example of the near-ubiquitous Western Digital hard/floppy controller board, and a Hercules/CGA video adaptor board. This last is based around a Yamaha LSI chip; although the review machine came with a monochrome monitor, therefore spending all of its time in

an apparently faultless Hercules emulation, previous boards of my acquaintance sporting this chip have suffered from CGA screens that flicker and snow in a similar manner to the original IBM PC. In any case, the more common VGA adaptor is an option — at a price.

The main chip, supported by the popular CHIPS set, saunters along at 12MHz; not bad for 1987 when it was introduced, but no longer an impressive speed. Around the back, one parallel and two serial ports share a backplane with a Microsoft mouse socket and the standard keyboard connector. The front is a model of restraint compared with the Hi-Grade's illuminated grandeur; two modest lights indicate power and hard disk activity, and a small barrel keyboard lock finished things off.

With the computer, Tulip bundles Windows 286 and DOS 4.01, which makes full use of the disk without having to divide it into two partitions. The documentation provided was rather odd — it seemed to consist mostly of German manuals, with the occasional multilingual book hiding a few sheets of English in between the rest of the tongues that will all be ours come 1992. The one exception is the MS-DOS manual itself; Tulip hasn't merely re-covered the Microsoft documentation, but has provided an extensive loose-leaf document in a substantial folder.

Although the design is no longer state-of-the-art, Tulip's efforts to maintain the competitiveness of the machine by cutting the price and bundling more software still makes it an attractive proposition.

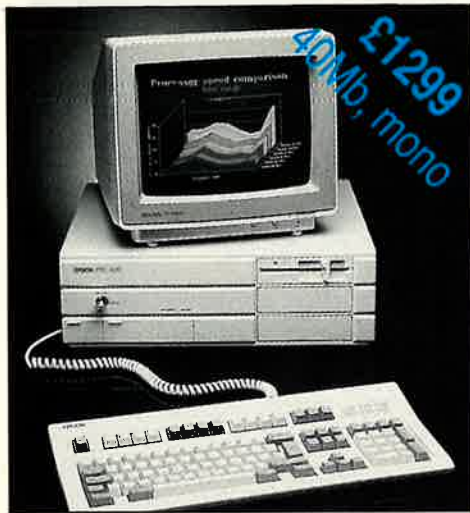
TANDON PCA-S1

Tandon is one of the original names in the PC compatible game, but its progression from the early days to the bustling, confused marketplace of today hasn't been without its problems. The company's new range of slimline AT compatibles, though, is seen by many as a strong argument for a new look at an old player.

Externally, the computer wouldn't look out of place in an advertising agency, with its swish strip of aquamarine and low (10cm) profile. Unlike many computers, the Tandon engineers have been responsible for most aspects of its design, and there's a higher degree of integration of features with the main circuit. The whole system is based around a rather unusual option, the Zymos POACH (PC On A Chip) set, which once seemed likely to corner the market before CHIPS and others leaped in. The processor chip is a

WHY NOW?

YOUR LAST CHANCE TO BUY EPSON PC'S FOR 40% OFF RRP!



PCAX 40/80. The power house of the PC series combining massive storage and expandability • High speed 6/8/12Mhz 286 • Very fast 28ms 40Mb or 80Mb hard disk • 640K memory, expandable to 15.5Mb • 9 expansion slots **PCAX40 with 40Mb, EGA system** . £1539



PCAX2 superfast, high performance, compact AT • High speed 8/12 Mhz 286 • 640K memory • Fast 40ms 20Mb hard disk • 6 expansion slots • Enhanced 102 keyboard • DOS 3.3 **PCAX2 with 20Mb, EGA system** £1189

WHY EPSON?

The **EPSON** name speaks for itself where reliability and quality are concerned. SCS is an official **EPSON** Silver Centre Dealer offering you the renowned **EPSON** PCe, PCAX2, PCAX hard disk computers and the **EPSON** PC portable for the most competitive prices ever in this end of summer sale.

This is your unprecedented opportunity to introduce high performance **EPSON** computing to your office, or to expand and upgrade an existing PC system.

WHY SCS?

SCS operate an **EPSON**-only division with the full backing of **EPSON**. Our customers benefit from unbeatable prices because we buy in bulk. As **EPSON** specialists your technical questions, operational problems or compatibility queries are dealt with quickly and efficiently.

Service - Guaranteed - Every product carries the SCS 7 day money back guarantee and full manufacturer's warranty. SCS is an official **EPSON** repair centre. All PC's can be customised to meet your specific requirements at no extra charge.

For ordering and further information:

PHONE our **EPSON** division
Sales hotline on
0635 529229

All prices exclude V.A.T., and delivery.
Showroom opening times:
Mon - Fri: 9.0-5.30
Sat: 9.0-12 noon

SCS Computer Sales plc,
24 Kingfisher Court,
Hambridge Road, Newbury RG14 5SJ.
Tel: 0635 529229 Fax: 0635 524302



PCe high speed XT compatible that is affordable and expandable • 640K memory • 20Mb hard disk • 5 option slots • 360Kb diskette drive • 4.77/10Mhz 8088 • Enhanced 102 keyboard • DOS 3.3 **PCe with 20Mb, EGA system** £939



PC Portable offering computer power with mobility and crystal clear backlit LCD • Fast 10Mhz V30 processor • DOS 3.2 included • 640Kb memory • Fully IBM compatible • 720Kb 3.5 in diskette drive • 20Mb hard disk • Laplink



WHY NOT!



Visit our Stand No. 2049 Personal Computer Show '89 Earls Court, 27th September - 1st October.

SCS - We're bigger because we're better.



12MHz 80286.

On the main board — as opposed to on an expansion-eating extra card — sits the floppy disk controller, using a Western Digital chip but with Tandon-designed support circuitry. This normally controls one 5¼-inch floppy drive; usually, there's no standard option for a 3½-inch floppy in addition, although it's possible to fit one internally. The hard drive — a 40Mbyte device — has an embedded controller. This moves most of the control circuitry to the drive itself, and needs only a connection to the PC's main board. This reduces complexity, but doesn't help reliability (if either the controller or the disk dies, then you'll have to replace both) and it isn't possible to just slide in an additional disk unit — you have to get another controller as well. As a side effect, there's no hard disk access light on the front panel, which has proved disconcerting.

In keeping with recent trends, there's a front-panel power switch, which is much easier to use than those found on the back of many clones. The power light — normally green — can change colour to indi-

cate a hardware problem, and the BIOS software, responsible for checking the computer when power's first turned on, gets the computer in a few seconds rather than the half-minute popular elsewhere.

Video is provided by a Hercules-standard adaptor on one of the four expansion slots; more expensive options include VGA with various monitors. The Tandon-badged monochrome monitor with the machine under test behaved oddly at times with graphics, with additional lines appearing; none of the adjustments removed them.

Around the back are two serial, 9-pin ports and one parallel printer socket, next to a recessed Reset switch. The inclusion of this is an indication of Tandon's long tradition of independent design, as is the physical construction of the case. Layer upon layer of metal supports and shielding belie the slim appearance to make a rugged, if difficult to disembowel, machine. To get at the main circuit board, for example, entails the removal of tens of screws.

The low height of the system is achieved by the slightly unorthodox siting

of the expansion slots. These are on a small board that sticks at right angles from the main circuit; although the power supply has a fan that pulls air across the whole setup the inclusion of a lot of memory might warm up the whole stack of expansion cards. There are a couple of conventional SIMM sockets on the board; these should take the 1Mbyte of Memory included up to the 3 or 4 needed to run OS/2, if this is thought a good idea.

Normally, the Tandon comes with its own variant of MS-DOS, a special version of 3.3 that can work with disks bigger than 32Mbytes. This system was adopted across the board with DOS 4. Whether you get any extra software or other goodies with the computer is up to the individual dealer.

The Tandon PCA-si is a step in the right direction for the company, and seems to have answered at least some of the criticisms levelled at earlier efforts. Whether it can compete against the razor-sharp commercialism of other computers in the crowded AT-compatible market place depends on the deals that people do, and its long-term reliability.

Simple Accounts II

Are you running a small business and would like to computerise your accounts – but are bewildered by complicated accounts packages? then read on

Simple Accounts II is written *specifically* as a genuinely easy to use accounting package for the small business – we *do not* produce Multi User Networking Systems or use confusing accounting procedure (for which you need to be an accountant to use!).

Although ease of use is the main aim there is no loss of features and facilities, here are some of them;

- * Complete Book-Keeping System
- * Rapid entry of transactions
- * Full bank/cash reconciliation
- * Full Vat accounting
- * In depth analysis/search facilities
- * Requires NO accounting knowledge
- * We are so confident that you can use our program with ease – we offer INDEFINITE FREE SUPPORT – other companies charge – ask yourself why?
- * Full Audit Trail
- * Monthly and year to date totals
- * Part payments catered for
- * Creditors and Debtors Reports
- * 100 page ringbound manual
- * RRP £129.95 (PC & compatibles)

Interested? – then why not give us a call and we will send you a **FREE** full specification manual on the program. A working evaluation copy is available at £19.95 inc. which is refundable on purchase of the full package.

Cornix Software (Sales) Ltd.

40b Queen Street, Hitchin, Herts, SG4 9TS Tel: (0462) 422232
DEALER ENQUIRIES WELCOME

Tandon

FREE ON-SITE MAINTENANCE WITH ALL HARDWARE

TANDON

	mono
TANDON PCX20	789.00
TANDON PCA/12sl	886.00
TANDON PCA/12sl-20	995.00
TANDON PCA/12sl-40	1095.00
TANDON PCA/12-SF	1167.00
TANDON PCA/12-40	1442.00
TANDON PCA/12-70	1648.00
TANDON PAC 286/12	1373.00
TANDON PAC 386sx	1563.00
TANDON Target 386sx	1763.00
TANDON 386/16-SF	1786.00
TANDON 386/16-40	1743.00
TANDON 386/20-SF	2060.00
TANDON 386/20-40	2369.00
TANDON 386/20-70	2541.00
TANDON 386/20-110	2644.00
TANDON 386/25-SF	3081.00
TANDON 386/25-110	3424.00
TANDON 386/25-300	4111.00
TANDON 386/33-SF	3630.00
TANDON 386/33-110	3974.00
TANDON 386/33-300	4661.00

NOVELL: Ethernet

Novell NE1000 Card	166.00
Novell NE2000 Fileserver Card	277.00
Novell NE/2 PS2 MCA Card	315.00
Micom N15210 Workstation Card	260.00
Micom NP600 Fileserver Card	550.00
3-Com 3C505 Fileserver Card	595.00
Western Digital Ethernet Card	168.00
ELS Netware 286 Level 1 V2.0A	325.00
ELS Netware Level II V2.15	845.00
Advanced Netware V2.15	1610.00
SFT Netware V2.15	2525.00
Advanced Netware 2.12	1400.00

IBM & COMPAQ & TULIP

Please call for best quotation

TOSHIBA

T1000	CALL
T1200F	CALL
T1200H	CALL
T1600	CALL
T3100e	CALL
T3200	CALL
T5100	CALL
T5200/40	CALL
T5200/100	CALL

SOFTWARE

Wordperfect V5	228.00
Lotus 123	269.00
Symphony	380.00
Freelance+	269.00
Agenda	210.00
DBase 4	367.00
Harvard Graphics	228.00
Supercalc 5	189.00
Microsoft Word.	252.00
Microsoft Excel	252.00

SPECIAL

**FREE
PORTABLE
PRINTER**

with every

Toshiba T1600

£2195

while stocks last.

PRE-INCREASE PRICES APPLY WHILE STOCKS LAST

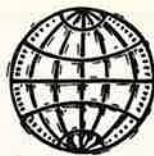
0800 521354

20 LINES



pc DIRECT

A DIVISION OF RAPID COMPUTER SYSTEMS PLC



Top Stream Machines

THE RANGE OF MACHINES BASED ON THE 80386 PROCESSOR HAS EXPANDED ENORMOUSLY IN RECENT YEARS. PETER JACKSON REVIEWS SOME OF THE MACHINES WHICH AMPLY ILLUSTRATE THIS DIVERSITY.

It seems only yesterday that the first 32-bit 80386-based PC-compatibles were introduced, and were instantly pigeonholed as high-end computer-aided design and network file server machines that would never appear on the average business user's desk. And indeed, the speed at which the 80386 has become the business standard has been staggering.

It is particularly staggering given the technical problems that the early 32-bit PC designers had to solve, and the ever-increasing difficulty of harnessing 80386 chips running at higher and higher speeds to the aging PC architecture. For example, if it was difficult making a 16MHz processor work at full speed and still keep compatibility with existing expansion hardware, imagine performing the same

trick at 33MHz. This is the official current top speed of the 80386, more than twice as fast as the version that made its first public appearance in machines from Advanced Logic Research and Compaq.

But the old saying that one person's problem is another's opportunity has never been truer in the computer business. The job of making fast processors work at their full potential with existing hardware, particularly slow RAM chips, slow hard disk drives, slow visual display screens, and slow expansion boards plugged in slow IBM-standard expansion slots, can be approached in various ways, and one PC designer or another has tried each of them not just on the lab bench but in a shipping machine.

In this sense, every 80386-based PC is

special in some way. One machine might have a special way of handling memory, while another will have an innovative method of coping with the inevitable and forthcoming processor upgrades. A third machine might speed up the video display hardware in some way, or use a disk controller that makes even slow hard disks deliver data at speeds to suit the 80386's top speed.

Each of the four systems discussed here has some feature, or collection of features, that makes it particularly notable in the 80386-based PC market. They might not be the best value, or the fastest, or the prettiest machines around, but they illustrate some important points about system design for the late 1980s and point up some factors to watch for in the 1990s.

IBM PS/2 MODEL 70-A21

The Model 70 range was part of IBM's second set of PS/2 launches in June last year, and the three machines announced then were the company's first desktop 80386-based systems. More than that, the fastest of the three — the Model 70-A21 — was and still is IBM's fastest PS/2 machine, faster than any of the tower-format Model 80 models.

It achieves this by running the 80386 processor at 25MHz rather than the maximum 20MHz of the Model 80, but there is more to the A21 design than this. For example, increasing the processor speed causes memory problems, as normal RAM chips are not fast enough to keep a 20MHz 80386 fully supplied with data, let alone a 25MHz one. And in this machine IBM for the first time chose to introduce a RAM cache, interposing a small area of very fast and very expensive RAM between the main memory banks and the processor.

In this set-up, every piece of data the processor reads from main memory is also read into the cache RAM area, so that if the processor needs the data again it can be read from cache, which is much faster than main memory.

But another IBM design decision makes the prospects for the future of the A21 look bright indeed. The brand new circuit board design required for the desktop for-



mat gave IBM the chance to save some board space, and make it easy to upgrade the A21 processor, by mounting the 80386, the 82385, and the cache RAM chips on a small piggy-back board plugged into a special socket on the main board. This meant that upgrading the processor would not mean throwing away the rest of the system; the main RAM banks on the motherboard — up to 8Mbytes — the three Micro Channel Architecture (MCA) expansion slots, and the 120Mbyte hard disk could be left as they were and a new piggy-back processor board plugged in ready to go.

Until recently, it was not clear what the processor upgrade might be. It was not

certain that a 33MHz 80386 chip and matching cache controller could be used, since increasing the speed of a circuit board by more than 25 per cent is not as simple as bumping up the speed of the main clock crystal.

Then, however, Intel announced the 80486 and everything fell into place. The 80486 running at 25MHz has higher performance than an 80386 at the same speed, so that an 80486 piggy-back board could go in an A21 without the main board design having to be altered. The 80486 also has an internal 8Kbytes of very, very fast cache RAM, so that the piggy-back did not even have to have a separate cache controller chip, simplifying the design and reducing the price.

And so it was no surprise when IBM announced the Power Platform, a dealer-installed 25MHz 80486-based piggy-back processor board for the Model 70-A21. All the dealer has to do is unplug the existing board, plug in the new, and swap the BIOS ROM chips for a new 80486-aware version. Total time taken, including dismantling and reassembling the A21, is around 10 minutes.

It is this upgradability, giving IBM the chance to offer its users new processor technology within weeks of its launch, that makes the Model 70-A21 more than just IBM's fastest PS/2. And of course, it is now commonplace for PC makers to put their processors and associated hardware on separate boards for just this reason; but IBM got there first, and got to market first with an 80486 machine.



ALR 33/386Z

As one of the originators of the 32-bit PC, ALR has made a name by keeping ahead in the 80386 performance stakes as each processor upgrade has appeared. It has managed this by taking most of the design and manufacturing tasks in-house, so that its cache controller circuits, for example, are custom-designed and the copyright of ALR.

But with the Z Series it has taken another tack. These are ALR's affordable machines, using older but proven technology and offering lesser performance but at much lower prices. And, in the case of the 33/386Z, offering a much smaller footprint as well.

Indeed, this machine is tiny compared with most 80386 machines, although it nearly matches the IBM PS/2 Model 70-A21 in overall size and is bigger than the HM Minstrel Workstation. In the default configuration it has a single 3½-inch floppy disk drive, holding 1.44Mbytes mounted vertically at the right-hand side of the case, although there is room for two more horizontally-mounted half-height 5¼-inch storage devices in the front panel. A second 3½-inch device, a hard disk since there is no way that this device can communicate with the outside world, can also be installed inside the case.

The key to the 33/386Z design is simplicity and low-budget design. The motherboard has a 33MHz 80386 and 82385 combination with 32Kbytes of 25ns static RAM, and room for just 2Mbytes of main RAM using conventional plug-in chips rather than the single-in-line memory module (SIMM) strips used by almost everyone else. There are no clever memory tricks apart from cacheing, although the main RAM chips are fast 60ns types to minimise the impact of cache misses on overall speed.

Extra memory can be added using an ALR 32-bit board that plugs into a hybrid 16-bit/32-bit slot; if the RAM board is

inserted it is a 32-bit RAM slot, but if no RAM board is present it acts like a normal 16-bit AT-compatible slot. Otherwise, there are five 16-bit slots and one 8-bit slot for further expansion.

But this expansion is limited, mainly because there is little room on the small motherboard for anything but the processor and cache controller and 2Mbytes of RAM sockets. The hard disk controller and a combined floppy disk controller and input/output board take up two 16-bit slots, while a third 16-bit slot is required for the 16-bit ALR-labelled Paradise VGA graphics board. So, in this configuration only two 16-bit slots and one 8-bit slot are left free.

In performance terms, the main electronics of the 33/386Z are as fast as anything else around. But shaving costs and sizes elsewhere limits performance in real-life applications like word processing. The 42Mbyte Fujitsu hard disk supplied was far too slow, with a 36ms access time compared with the 15ms or 17ms times offered by bigger ESDI drives in other systems, although ALR does offer larger and faster 5¼-inch drives and does bundle the excellent Super PC-Kwik disk cacheing package with the machine to limit the impact of slow disk access.

What is special about the 33/386Z is its small scale, and that it demonstrates how manufacturers can shave edges here and there and still produce a PC with state-of-the-art performance in most places, and a price low enough for most users to ignore the rough edges. In this sense, the 33/386Z is the 33MHz PC for the rest of us — commodity Philips monitor, cheap clone keyboard, clunky hard disk and all.

HM SYSTEMS MINSTREL WORK- STATION

If the ALR machine was small, the HM Minstrel Workstation is miniscule. The company's adverts show it taking up just about a third the desk space of an IBM AT, and the monitor perches on top of it in a rather overbearing way.

And inside the box, HM has done more compression work. The system is built around a 'passive backplane', a set of four standard AT-compatible expansion slots on a board with no other electronics on it at all. The computer itself is all built onto a single board the same size as any PC expansion board, but which includes the main processor, 1Mbyte of RAM, VGA-compatible graphics hardware, parallel and serial ports, floppy disk controller,



and everything else required to make a PC clone. RAM can be expanded to 5Mbytes using a piggy-back board attached to this main board, using conventional memory chips and sockets rather than SIMM chips.

As described earlier for the IBM Model 70-A21, there are advantages to putting the processor at least on a separate board. HM's selling point is that it puts the whole computer on a replaceable board, and in fact it is already selling different systems that differ only in the processor board, with the rest of the hardware remaining the same.

But as was also described above, many other manufacturers, including big names like AST and smaller names like Kaypro and Tulip, are doing exactly the same. Tulip is even using the same 16-bit version of the 80386, the 80386SX, as HM's current fastest machine, and has produced full 80386 machines while HM is still only promising them. The full 80386 system from HM will definitely come, but there are some problems; the main ones are the increased amount of hardware required and the fact that the passive backplane is only 16-bit while the 80386 is 32-bit. For both these reasons, the 80386-based system from HM will require two linked boards rather than one, and will not make much sense in the four-slot workstation. And the company is also promising an 80486-based system, using the same techniques and again realistically requiring more slots than the workstation case can provide.

However, the Workstation does have one major advantage over the competition, which is its hard disk controller. While other manufacturers either use half-height 5¼-inch or 3½-inch drives to save space, and then live with the speed reduction or bundle disk cacheing software, HM has provided a hardware fix. While a normal disk controller based on Western Digital hardware is available, the recommended option for the Workstation is a Konan Tentime cacheing controller.

The Konan board has 128Kbytes of

RAM and dedicated cache control hardware, and as its name suggests it is claimed to improve the disk access speed of most software by a factor of ten. It does this not only by keeping copies of the most-often-required disk sectors in its cache RAM, but by using its built in logic to cut down 'latency', the time a disk controller normally has to wait while the disk physically spins to bring the right sector under the read and write head, and by using sophisticated algorithms to keep as much of the necessary disk data in its cache RAM as possible. It also uses unconventional disk seeking routines, such as 'elevator seeking' to cut down the amount of time-consuming in-and-out movement of the read-write head.

For example, say the computer tells the controller to retrieve a sector from track 400, followed by a sector from track 100 and then a sector from track 700. In conventional controllers, the disk head would be moved first to track 400 to read the first sector, then right back to track 100 for the second, and then right out past 400 again to get the last sector from track 700. In elevator seeking, the controller collects a batch of read instructions, checks which track it is currently on, and then works out the best order to perform the reads. In our example, say the head is on track 200 to start with. Then, the most efficient read order in terms of head movement is to read the track 100 sector first, then the track 400 sector, and then the track 700 sector; the controller works this out, performs the reads, and then re-orders them so that the computer gets the data in the order it expects.

Minimising mechanical movement in a hard disk is the secondary job of a caching disk controller, following the main task of keeping as much data as possible in its own RAM rather than on disk surfaces, and the Konan board makes a good job of it. It even backs up the 128Kbyte cache RAM on the board with a battery, since it caches writes to disk as well. Without battery back-up, a power failure could leave some disk writes in the cache rather than on disk, which could cause file integrity problems.

With a 20MHz 80286 and the Konan board, the Minstrel Workstation can outperform many 80386 systems with similar processor speeds in real-life applications. And with a 16MHz 80386SX, the normal performance degradation compared with a full 80386 is concealed by the caching controller.

So the special features of the Minstrel Workstation are its size, its upgradability — although the two-board 80386-based processor set may take up too much room — and its caching disk controller. Oh, and the fact that it is designed and built in the UK.



COMPAQ DESKPRO 386/33

For once in its life, Compaq was beaten to the punch with a new 80386 processor. The first 33MHz PCs appeared on the market from companies like Zenith in the US and Acer in the UK, while Compaq arrived a little later with a new machine in a market sector it still dominates.

But the DeskPro 386/33, when it finally arrived, confirmed the design directions that Compaq has laid out for all its future machines and has set some new standards for other makers to follow.

First of all the 386/33 is small, or at least small compared with similarly-configured systems from other manufacturers. But the space has been well used, with room for three half-height storage devices in the front panel and space for two more half-height devices in the rear, although of course these five bays could be adapted to take two full-height hard disks — Compaq offers them in 110, 320 and 650Mbyte sizes — and a single half-height floppy drive. This last configuration would be particularly useful if the machine was being used as a file server, since two big, fast hard disks could be used to 'mirror' each other so that their contents were always the same. Then, under the control of software like Novell's System Fault Tolerant (SFT) Netware, the failure of one disk would simply switch in the other without the users knowing that anything had gone wrong.

Inside the case there is equal evidence of

good design. A single RAM board with 2Mbytes fitted as standard, and capable of holding a full 16Mbytes using various piggy-back RAM modules, fits in a single dedicated 32-bit slot; beside this there are seven conventional expansion slots, one 8-bit and the rest 16-bit. And the remarkable thing about this machine is that in a fully-configured hard disk system all these slots can be free for extra expansion boards. The DeskPro 386/33 is a prime example of integration, using modern electronic technology to build in as much as possible as standard, to give users room to grow in the future.

On the motherboard are the 33MHz 80386 processor, a 33MHz 82385 cache controller with 64Kbytes of fast cache RAM, VGA-compatible graphics hardware and video memory, serial and parallel interfaces for modem and printer, hardware to handle the keyboard and dedicated mouse sockets, and floppy and hard disk controller circuitry. This last item is important, since it follows the current trend to use hard disks with their own controllers built in; a trend that has produced its own new acronym, IDE, standing for Integrated Drive Electronics.

As a result of all this, with tightly-packed large scale custom chips on a motherboard no bigger than an AT clone's, the DeskPro 386/33 buyer will be able to set up a system with a single 5¼-inch floppy drive, an 84Mbyte hard disk, VGA graphics, serial and parallel ports, mouse and keyboard, and still have seven expansion slots and three half-height storage bays free. With the larger full-height drives an extra expansion slot is taken up by the 16-bit ESDI controller, but that still leaves plenty of room for growth.

Everywhere in this system there are examples of Compaq's attention to detail and compatibility. For example, a tiny circuit board in a dedicated socket brings the VGA signals from the motherboard hardware out to a connector identical to that on IBM's VGA board for PCs. This means that IBM's 8514/A high-resolution graphics board, which expects that edge connector to be in a particular position, will find Compaq's connector in precisely the right place. And for a second example, installing hard disks in the rear of the machine is as simple as it is at the front, thanks to a removable rear panel.

What is really special about this system is not its performance, since even at 33MHz this Compaq machine is slower than other competitors from Zenith, Everex and Tandon. What is special is that it is beautifully designed, perfectly built, provides everything that a user might need with plenty of room to grow, and simply exudes confidence and reliability. It shows a major manufacturer at the height of its powers.

HIDDEN POWER



COMPETITIVE EDGE

In today's competitive market give yourself a competitive advantage with the latest in portable computing. Compaq the world leader in portable personal computing now offers full function desktop power in the space of an average notepad, and weighing in at a mere 14lbs, the Compaq SLT/286 is designed with true portability in mind.

Think of the added value to your business in being able to use computing to sell – how many of your competitors do? Extensive Price Lists, Actuarial Tables, Spreadsheets, Clinical Properties of Pharmaceuticals, Balance Sheets and Financial Analysis can be held on either a 20Mb or 40Mb Hard Disk option, add communications facilities and you can even communicate with your corporate mainframe or mini computer system.

The Optional Desktop expansion base allows you to install up to two industry standard cards to configure the system for particular applications such as attaching to your in house local area network when back in the office.

As one of Compaq's largest dealers in the UK, Simmons Magee Computers have extensive experience of installing Compaq computers in applications as diverse as Desk Top Publishing and Dealing Room systems and we also offer the following added value services to the corporate business user.

CONSULTANCY

With the dramatic increase in PC based applications, many users are confused with the plethora of products available. Quite often consultancy can help you to choose the correct application for your business, and to ensure that you are buying products with a long life span.

POST SALES SUPPORT

Once you have had your system installed, our Post Sales Support group becomes responsible for ongoing development and support. We offer a wide variety of tailored agreements from basic telephone support for the experienced PC user through to nationwide Systems Support Agreements to cover the needs of critical applications.

TRAINING

You will not have a competitive edge if you can't use the system. At Simmons Magee we have invested heavily in our training facilities to help you make the most productive use of your computer systems, even to the extent of offering a one to one training course on a wide range of applications software to avoid time being wasted on items not of relevant interest.

ENGINEERING

As you would expect from a service orientated company Simmons Magee offer a wide variety of maintenance agreements designed specifically to meet the needs of our end users. Our Regional Engineering offices have highly trained engineers equipped with the latest in test and diagnostic equipment, backed up by our computerised call control system and radio page systems.

For further information on the Compaq SLT/286 and the services available from Simmons Magee please indicate your area of interest on the response card, or call us direct on 01-948 3114.



Marketing Services, Simmons Magee Computers PLC.,
One Dee Road, Richmond, Surrey TW9 2JN.

Name: _____ Position: _____

Company: _____

Address: _____

Phone: _____

☐ Compaq SLT/286
☐ Training

☐ Consultancy
☐ Engineering Services

COMPAQ
SLT/286



Power Prize



A complete 386-based personal computer system from CompuAdd is our competition prize this month.

With this issue of *PCWorld Focus* majoring on 'Choosing a system' it seemed obvious to us that we should give you the opportunity of winning a power user's system of your own. And thanks to the generosity of CompuAdd over £5,000 worth of hardware and software can be yours. All you have to do is answer the easy questions below.

The prize consists of a CompuAdd 386SX computer with 2Mbytes of RAM, 40Mbyte hard disk, and VGA colour graphics card and monitor. On top of this there is a Hewlett-Packard Laser Jet II laser printer and some software. Not just any old software, but a complete suite of packages from Microsoft comprising Microsoft Word, Microsoft Excel and Windows 386. And to make it all easier to use

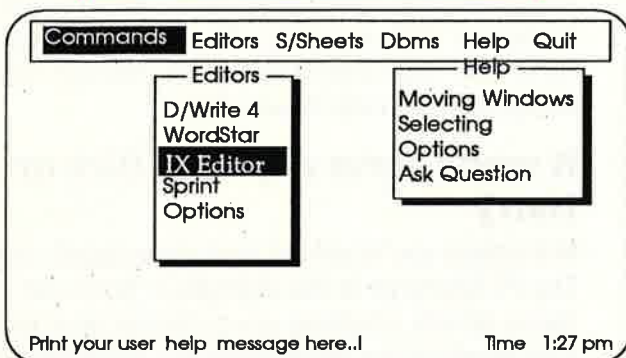
there's a Microsoft Mouse as well.

To stand a chance of winning this high class combination, write the answers to the five questions on a postcard and mail it to: CompuAdd System Competition, *PCWorld Focus*, VNU House, 32,34 Broadwick Street, London W1A 2HG, to arrive by 31 October 1989, entries not on postcards

multiple entries and those from employers (and their relatives) of VNU and the prize giving companies are ineligible. The winner will be decided by PCW's editor in conjunction with representatives of the participating suppliers. The editors decision is final.

QUESTIONS

1. On what date was CompuAdd launched in the UK?
2. In the US CompuAdd is based in the same city as another direct marketing company. Which city and which other company?
3. What was the original 'codename' for the 386 SX cpu?
4. Apart from those mentioned above, what other Microsoft product is shipped with the prize in this competition?
5. In not more than 25 words describe how the combination of hardware and software that forms the prize could be used to help the local community group

NEW DOS Management**MENU - IX****FEATURES****£49.95**

Suggested 64 Menus with 512 Items
Only Limited by RAM Capacity
 Pull Down Menus & Pop Up Help Windows
Complete online Help System
 Help Generator
Supports Full System Calls & Multiple Calls
 Runs under DOS, Xenix & OS/2
All this Customised by You for
Your Own Specific Requirements!
 Network / Multiuser Licences Available Please Call.

DATA Protection**TSR LOCK - IX**

Terminate Stay Resident Software Keyboard Lock With Password Protection. Specify a predetermined time interval, between 2 - 30 minutes and specify a password. **Lock-IX**, locks your terminal automatically if you leave it unattended longer than the preset time period. Your terminal is released only after correct password is entered.

Selling in 100s £10.00

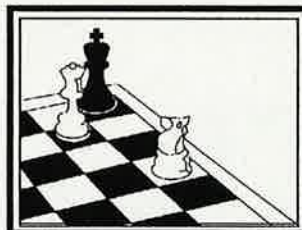
Network / Multiuser Licences Available Please Call.

IDEAL For Security Conscious Sites**CSH-IX****A Complete Unix C Shell running under DOS****Internal Commands**

a: to h:	foreach	popd	case	glob	prompt
alias	end	printenv	breaksw	ignoreeof	savehist
cd	goto	pushd	default	kill	shell
cls	history	repeat	endsw	login_shell	status
commands	if	set	unalias	noclobber	swap
dirs	else if	setenv	unset	no_command	
echo	endif	shift	unsetenv	noglob	
eval	logout	source	while	nonomatch	
exit	onintr	switch	argv	path	

£49.95**NEW CD-ROMS**

12 Language Translating Dictionary,
 Oxford Text Book of Medicine,
 Grolier Electronic Encyclopedia,
 Webster's or Oxford Dictionary,
 Sherlock Holmes on Disk,
 Shakespeare on Disk,
 Bible Library,
 PC-SIG Library,
 World Atlas
 and MANY MORE
Call for prices !

INTERACTIVE 386 IX**ETHERNET****UNIX****DOS****XENIX NET****NOVELL****XENIX****OS/2****AIX****MICROPORT SYS V****TOKEN RING****TCP/IP**

Look to us for some of the best hardware deals in the UK. **"GENERIC SYSTEMX"** Base units start at incredibly low prices. Specific configurations are too varied to advertise, please call for quotes.

Generic System 286X

286/12 MHz £ 695.00
 286/16 MHz £ 950.00
 286/20 MHz £ 950.00
 8086/10 MHz £ 499.00

Generic System 386X

386/16 MHz £ 950.00
 386/20 MHz £1695.00
 386/16 MHz £2095.00
 386/20 MHz £2995.00

Hardware Options

☆ 512K to 16Mb RAM,
 ☆ 20Mb to 330Mb Hard Disk
 ☆ 3.5" or 5.25" FDD Option
 ☆ Math Co-processors
 ☆ Hardware Maintenance
 ☆ Software Maintenance

All prices exclude VAT

VISA, ACCESS, AMEX, DINERS

Information Pack
 Programming Utilities
 Demo Disk

System IX Networks Ltd / GW Computers Ltd

55 Bedford Court Mansions
 Bedford Avenue
 London WC1B 3AG

Tel (01) 636 8210 / (01) 6 31 4818

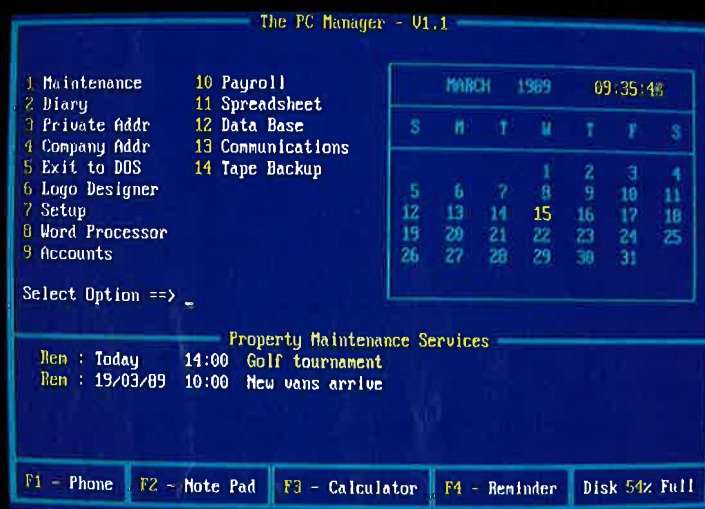
Cellnets: (0836) 664367 / (0836) 770362. Fax: (01) 255 1038. Data: (01) 436 4609

Price List
 Sales Enquiries
 Demonstrations

PRESS RELEASE !

10's of thousands of programs **FREE** on
 our bulletin board system. Subscription **£10**

A SELECTION FROM OUR MENU...



The PC
Manager-
big appetite,
less bytes.

Greenscreen

GREENSCREEN Business Software Ltd
20 Alexander Close, Waterlooville, Hants. PO7 5TB

Our PC Manager has quite an appetite

Up to 72 applications can be loaded in fact - Password protection - Auto park - Private and Company address books - Phone lookup key - Note pad - Calculator - Reminder - Screen Logo designer - Calendar driven diary.

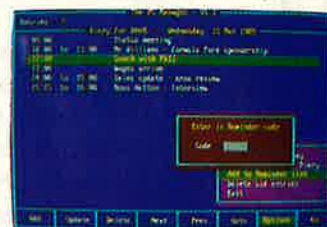
It won't serve any Tom, Dick or Harry

Not unless you're armed with a password, that is. The PC Manager is the ultimate in front end menu drivers, enabling you to access and update your applications programs easily. With password protection "on", it will allow you to set up a multi-user environment, and by giving each user their own passwords, you can restrict access to selected applications if required.

The PC Manager is no ordinary menu driver and possesses several utilities which are essential for running an efficient office, or a well organised personal computer system at home. Add to this the fact that you can load your choice of applications packages, and you end up with a powerful combination that will enhance the use of your PC.

Full Waiter Service

Oh, and just in case you do need some help with the PC Manager, you can use our telephone hot-line service for advice.



Full feature diary



Private & company address books



Design your own screen logo

ONLY
£79.00

+ VAT

IF WE'VE WHET YOUR APPETITE,
THEN TELEPHONE
0705 - 268519
FOR A FULL MENU.

INCREASE YOUR WORDPOWER WITH KEYWORD

The essential enhancement for your Wordprocessor

Now you don't have to go hunting backwards and forwards through your thesaurus when you're looking for alternative words, because Keyword is a complete word finder — on disc!

At the touch of a button you can instantly select up to 70 synonyms in any of 1,000 categories — giving you an effective vocabulary of 70,000 words.

And it's so easy to use. Simply type in the first few letters of a word and you'll be shown all the entries in the dictionary that start with those letters. Then, using the cursor keys (or mouse if you have one), just pick the word that's nearest to the one you're looking for and you'll be presented with a comprehensive list of synonyms.

If your target word isn't there, select the most suitable entry and you'll see a new, more closely related list — and you can keep doing this until you find the exact word you require.

If you ever find yourself stuck for words, Keyword is the answer! Send for your copy today and you'll never be tongue-tied again.

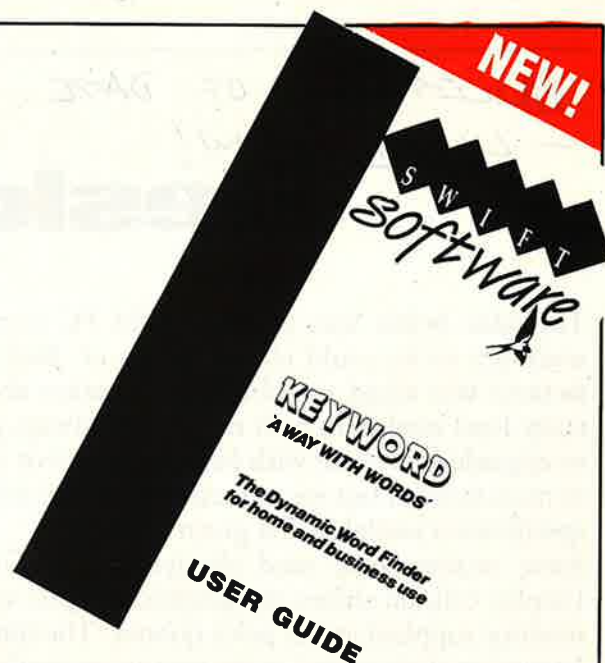
What the press say

"As a word finder for everyday use it is excellent . . . Next time I am stuck for a word I shall be using Keyword rather than reaching for the thesaurus on the bookshelf." — *The Micro User*.

"It needs no lengthy technical manual to explain how it works, while its size, speed and simplicity are impressive." — *Basildon Evening Echo*.

"Keyword will interest anyone who uses a wordprocessor for more than notes to the milkman." — *New Computer Express*.

"There is no doubt that this is a useful and powerful piece of software . . . Give me convenience every time" — *Election User*.



ORDER FORM

PCW10

We despatch all orders on the day of receipt by first class post

Please send me Keyword for the following:

(Please tick)
 Amstrad CPC 3" Disc £14.95 ☐
 Archimedes 3.5" Disc £19.95 ☐
 Atari ST 3.5" Disc £19.95 ☐
 BBC/Electron 3.5" ADFS Disc £14.95 ☐
 BBC/Electron 5.25" 40T DFS Disc £ 9.95 ☐
 PC Compatible 3.5" 720K Disc £19.95 ☐
 PC Compatible 5.25" 360K Disc £19.95 ☐

I enclose a Cheque/Eurocheque/PO made payable to Swift Software.

Name _____
 Address _____

 Post Code _____
 Telephone _____

Swift Software, PCW10, 6 Ennerdale Road, Stockport, SK1 4NR — 061 477 8405

HARDWARE

All equipment thoroughly tested prior to delivery. No Quibble replacement (within 3 days of delivery). One year parts & labour guarantee. FREE preventative maintenance pamphlet.

Model	Mono	EGA	VGA
OPUS PC3 8088-1 1024k 30mg. HD	949	1269	
OPUS PC4	1150		1525
OPUS PC5 80286 1024k 30mg. HD	1269	1549	1689
OPUS PC7 80386 4mg RAM 70mg HD	3309		3649
ACHTER/HYUNDAI Floppy (For Network)	550		
EPSON Printer 24 pin LQ500 (80 col)			329
EPSON Printer 24 pin LQ850 (132 col)			489
EPSON Printer 24 pin LQ1050 (robust 132 col)			659
EPSON Printer 24 pin LQ2550 (heavy duty 132 col)			1019
HP LASERJET II (It set the standard)			1525
QUME CRYSTALPRINT Laser (HP Series II compatible)			1325
QUME CRYSTALPRINT PUBLICATION (POSTSCRIPT)			2399
GENIUS MICE - BARGAIN			29

Software

We only sell what we know well - And we'll support you afterwards. We specialise in tailoring your software by application programming. Ring for a chat if you've got problems.

SMART Integrated Suite V3.1 (Simply THE best)	385
SMARTWARE II (Better than Smart II)	439
FRAMEWORK III Integrated (Much Improved over V2)	325
EXCEL Spreadsheet (EXCELlent)	299
SUPERCALC 5 (Top of the range spreadsheet)	229
LOTUS 123 V2.0 (Copy protected industry standard)	279
WORDPERFECT 5 (Ultimate Wordprocessing)	239
MICROSOFT WORD 5 (Superb Wordprocessor)	299
WORDSTAR 2000+ (Well, what can you say?)	249
VENTURA 2 (Rolls Royce Desktop Publisher)	495
SAGE Accountant Plus (Robust small business)	189
SAGE Financial Controller (with Sales processing)	289
HARVARD Total Project Manager (Information Management)	359

Networking

We are experienced site surveyors, installers and trainers in NOVELL systems (beware of cheap networks). Ring for good advice

Software	4 User Kit
NOVELL ELS 1 (1 - 4 User)	559
NOVELL ELS 2 (1 - 8 User)	989
NOVELL Advanced (1 - 100 User)	1949
EXAMPLE: 286-Based 4 User System Complete	4949



Computer Solutions (Wales) Ltd.

35 Heol Eglwys, Ystradgynlais,
SWANSEA SA9 1EY

TEL (0639) 845400



ACCOUNTS

We specialise in total accounting solutions, helping customers through what is a critical phase in business systems development. If you need consultancy, training, advice - or simply an off-the shelf package - then give us a ring. A Chartered Accountant is available to advise you.

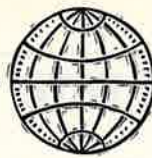
GRAFFCOM Accounts II

In Our view, one of the best packages on the market
 * on line help * drop down windows * pop up enquiries * desktop utilities * integrated *lotus like* spreadsheet/graphics * Total reporting flexibility * Stylish stationery * Available for MS DOS, OS/2, networking and multi user environments * demonstrations arranged

*** SUBSTANTIAL DISCOUNTS AVAILABLE ***

Module (Single User Prices)	MSDOS	OS/2
Sales Ledger Invoicing	375	675
Purchase Ledger	375	675
Nominal Ledger	375	700
Stock Control	300	600
Order Processing/Invoicing	350	650
Payroll	425	700
Job Costing (This module is outstanding)	350	650
Quintet Spreadsheet/Graphics	175	375
Desktop Utilities	65	165
SOFTPACK 1 (Nominal, Sales, Purchase, Invoicing, Spreadsheet, Desktop)	950	1950
SOFTPACK 2 (Stock, Order Processing, Sales, Spreadsheet, Desktop)	850	1850
EXAMPLE MULTI-USER PRICES (4-User System)		
SOFTPACK 1	1710	
SOFTPACK 2	1530	

*PRICES EX-VAT & SUBJECT TO CHANGE * CARRIAGE EXTRA



PRICES OUT OF DATE
— LOWER NOW!

Desktop PCs

The table below lists as many IBM PC compatible machines as we could obtain details of. Each manufacturer was asked to submit information about the entry-level models in each range. It is always possible to upgrade a machine with better graphics or memory or mass storage, but we wanted to show the minimum specification available at a given price.

Some sections may need clarifying. The Graphics/Display column shows the graphics adapter card and monitor supplied at the price quoted. The number of Expansion slots quoted is the maximum available and you may find that the actual number free is considerably less as slots are often used for disk controllers, graphics and serial and parallel ports. Open and closed drive bays indicate how many storage devices you can install. Floppy disk drives and tape streamers can only

be installed in open bays whereas hard disks can usually be installed in both open and closed drive bays.

Finally it is worth adding a note of caution. Specifications and prices of computers change all the time. Before making a purchasing decision you should contact the manufacturer to check out how much the actual configuration you want will cost. Some manufacturers charge extra for keyboards and operating system. All prices quoted exclude VAT and prices and specifications shown are those supplied to us by the manufacturers.

We made contact with practically every manufacturer of PCs in the UK. Our apologies if any were missed out or if any company was unable to supply us with the information we required and is not included in the table.

Manufacturer & Machines	Price	Disk drives			Memory supplied/ max on board	Graphics display	CPU & speed	footprint mm	ports serial/parallel/mouse	Total Expansion slots	Switches reset turbo	Drive bays open closed	Support and warranty
		3 1/2 (high density)	5 1/4	hard disk									
Amstrad (0277) 22888													
Amstrad PC1512	£399		1		512K/640K	CGA/MON	8086-8	37x38.4	1ser 1par 1mou	3		2o	1yr
Amstrad PC1640	£499		1		640K/640K	EGA/MON	8086-8	37x38.4	1ser 1par 1mou	3		2o	1yr
Amstrad PC2086	£599	1			640K/640K	VGA/MON	8086-8	36.5x39.5	1ser 1par 1mou	3		3o	1yr
Amstrad PC2286	£999	1			1M/16M	VGA/MON	80286-12	41.5x48.5	1ser 1par 1mou	5		3o	1yr
Amstrad PC2386	£2,649	1			4M/16M	VGA/MON	80386-20	41.5x48.5	1ser 1par 1mou	5		3o	1yr
AMT (01) 450 3222													
AMT Platform 307	£10,340	1	1	620M	2M/8M	HERC/MON	80386-30	59x23x60	2ser/1par	8	reset/turbo	2FHc/3FHc	1yr
AMT PowerMaster 320	£2,425		1	40M	1M/8M	HERC/MON	80386-20	43x18x53	2ser/1par	8	reset/turbo	3HHc/1FHc	1yr
AMT PowerMaster 325	£4,075		1	70M	2M/8M	HERC/MON	80386-25	46x20x69	2ser/1par	8	reset/turbo	4HHc/4HHc	1yr
Apricot (021) 456 1234													
Apricot Qi 310	£2,298	1			1M/16M	VGA/MON	80386SX-16	42.9x38.6	1ser 1par 1mou	4	reset	1o/1c	1yr
Apricot Qi 330	£2,898	1		30M	1M/16M	VGA/MON	80386SX-16	42.9x38.6	1ser 1par 1mou	4	reset	1o/1c	1yr
Apricot Qi 650	£5,398	1		47M	1M/16M	VGA/MON	80386SX-20	42.9x38.6	1ser 1par 1mou	4	reset	1o/1c	1yr
Apricot Xen-S 240X	£3,298	1		44M	1M/5M	VGA/MON	80386SX-16	38x37	1ser 1par 1mou	4	reset	1o/1c	1yr
ARC (01) 684 4144													
ProTurbo 88	£875		1		640K/640K	MON	8088-9.54	13.5x36.5x42	2ser/1par	4	turbo	3o	1yr
ProTurbo 286	£895		1		1M/16M	EGA/MON	80286-8/12	13.5x36.5x42	1ser/1par	5	reset/turbo	3o	1yr
Turbo 12	£1,395		1		1M	MON	80286-12.5		2ser/1par	8	turbo	2o/3c	1yr
3865 Skyscraper	£3,050	1	1		2M/12M	EGA	80386-8	59.7x16.6x48.2	2ser/1par	8	turbo	4HHc/1FHc	1yr
Arche (0602) 862700													
Parade 8088	£826	1	1		640K/640K	HERC/MON	8088-10	40x41x11	1ser/1par	5	turbo/reset	2HHc/1HHc	2yrs
Rival 286-16	£2,200	1	1	49M	2M/4M	HERC/MON	80286-16	42x43.5x17.5	2ser/1par	8	turbo/reset	2HHc/1HHc	2yrs
Parade 286-12	£1,764	1	1	30M	1M/4M	HERC/MON	80286-12	40x41x11	2ser/1par	5	turbo/reset	2HHc/1HHc	2yrs
Rival 386-20	£2,400	1	1	49M	2M/2M	HERC/MON	80386-20	42x43.5x17.5	2ser/1par	8	turbo/reset	2HHc/1HHc	2yrs
Profile 386-20	£3,383	1	1	80M	2M/2M	HERC/MON	80386-20	61x14x49.5	2ser/1par	8	turbo/reset	4HHc/3c	2yrs
Profile 386-25 Cache	£5,625	1	1	80M	4M/8M	HERC/MON	80386-25	61x14x49.5	2ser/1par	8	turbo/reset	4HHc/3c	2yrs
Arkel (0858) 32495													
Arkel 286i	£999		1H	20M	1M/8M	MON/MON	80286	43X42X16	2ser 1par	5	reset/turbo	3o 1c	2yr
Arkel 386i	£1,649		1H	40M	1M/16M	MON/MON	80386	43x42x160	2ser 1par	5	reset/turbo	3o 1c	2yr
AST (01) 568 4350													
AST 386/33 105	£5,795		1	110M	2M/36M	VGA/MON	80386-33	48.9x41.9	2ser/1par	7	reset/turbo	3o/2c	1yr
AST 386/25 95	£4,995		1	90M	2M/36M	VGA/MON	80386-25	48.9x41.9	2ser/1par	7	reset/turbo	3o/2c	1yr
AST 386C 340C	£3,195		1	40M	1M/16M	VGA/MON	80386-20	48.9x41.9	2ser/1par	7	reset/turbo	3o/2c	1yr
AST 386/16 45	2595		1	40M	1M/16	VGA/MON	80386-20	48.9x41.9	2ser/1par	7	reset	3o/2c	1yr
AST Workstation 386SX45	2695		1	40M	1M/16M	VGA/MON	80386SX-16	40.7x37.6	2ser/1par	2	reset/turbo	1o/1c	1yr
AST 286 120	1975		1	20M	1M/16M	EGA	80286-10	48.9x41.9	2ser/1par	7	reset/turbo	3o/2c	1yr
AST Bravo/286	£1,295		1	40M	512K/16M	VGA/MON	80286-8	38.1x38.7	2ser/1par	4	reset	2o	1yr

Manufacturer & Machines	Price	Disk drives			Memory supplied/ max on board	Graphics display	CPU & speed	footprint mm	ports serial/parallel/ mouse	Total Expansion slots	Switches reset turbo	Drive bays open closed	Support and warranty
		3 1/2 (high density)	5 1/4	hard disk									
Atari (0753) 333444													
Atari PC4			1		1M/8M	VGA/MON	80286-10		2ser/1par	6	reset/turbo	2o/1c	Via dealer
Atari PC5			1		1024K/10M	VGA/MON	80386-10			5	turbo	1o/1c	Via dealer
Blue Chip (0491) 34838													
Master 286			1	40M	512K/1M	EGA	80286-12		2ser/1par	8		3HH	1yr
Master 386			1	40M	1M/4M	EGA	80386-16		2ser/1par	8		3HH	
XT			1	20M	512K/640K	EGA	8088-2-16		1ser/1par/1 mou				1yr
AT			1		640K/1M	EGA/MULTI	80286		1ser/1par	5			1yr
Brother (061) 330 6531													
Brother BC10F1	£548		1		640K/640K	GA/HERC/MC	8088-87	36.7x39	1ser/1par	4	reset	2o/2c	Hotline
Brother BC20F1	£898		1		1M/1M	GA/HERC/MC	80286-10	38.7x40.4	1ser/1par	4	reset	3o/3c	Hotline
British Telecom (0800) 282444													
BT M5210 Series	£1,345	1			1M/6M	VGA/MON	80286-12	35.5x38.0	2ser/1par	3		2o/1c	1yr
BT M5220 Series	£1,445	1			1M/6M	VGA/MON	80286-12	35.5x38.0	2ser/1par	5		2o/1c	1yr
BT M5330 Series	£3,300	1			2M/16M	VGA/MON	80386-16	53.3x41.9	1ser/1par	10		2o/1c	1yr
Data General (01) 572 7455													
Data General Dasher/286	£1,882	1	1	20M	640K/4.6M	EGA/MON	80286-10	41.3x44.5	2ser/1par	12		2o	1yr
Data General Dasher/386	£3,602		1	40M	1M/16M	EGA/MON	80386-16	38.1x54.4	1ser/1par	4		2o	1yr
Dell (0800) 414535													
Dell System 200	£1,199	1	1	20M	640K/4.6M	HERC/MON	80286-12.5	53.3x41.9	2ser/1par	6		3o/2c	1yr/Hotline
Dell System 220	£2,049	1		40M	1M/8M	VGA/MON	80286-20	38.4x39.7	2ser/1par	3		2o/1c	1yr/Hotline
Dell System 316	£1,949	1	1	40M	1M/8M	VGA/MON	80386-16	53.3x41.9	2ser/1par	8		3o/2c	
Dell System 325	£3,949	1	1	90M	1M/16M	VGA/MON	80386-25	53.3x41.9	2ser/1par	8		3o/2c	1yr/Hotline
Dell System 310	£2,499	1	1	40M	1M/16M	HERC/MON	80386-20	53.3x41.9	2ser/1par	8		3o/2c	1yr/Hotline
Digital Matrix (021) 704 1399													
Mat-386/20	£1,087	1			1M/8M	HERC/MON	80386-20	40.5x30	2ser/1par	8	reset/turbo	3o/1c	2yrs
Mat 386/25D	£1,715	1		20M	1M/8M	HERC/MON	80386-25	40.5x30	2ser/2par	8	reset/turbo	3o/1c	2yrs
Mat 386/30T	£2,480	1		42M	1M/8M	HERC/MON	80386-30	42x20	2ser/2par	8	reset/turbo	6o/1c	2yrs
Mat 386/33T	£33,085	1		65M	1M/8M	HERC/MON	80386-33	42x20	2ser/2par	8	reset/turbo	6o/1c	2yrs
Mat386/20SX	£1,325	1		20M	1M/8M	VGA/MON	80386-20	36x39	2ser/2par	8	reset/turbo	4o	2yrs
Digitask (0293) 776688													
Axiom XT-15	£895	1	1	32M	1M/1M	HERC/MON	8088-15	43x41	1ser/2par	8	reset/turbo	3o	1yr
Axiom 286-12	£1,395	1	1	65M	1M/4M	HERC/MON	80286-12	43x41	1ser/2par	8	reset/turbo	3o	1yr
Axiom 286-24	£1,795	1	1	65M	2M/8M	HERC/MON	80286-24	43x41	1ser/2par	8	reset/turbo	3o	1yr
Axiom 386SX-16	£2,195	1	1	65M	2M/8M	HERC/MON	80386 SX-16	43x41	1ser/2par	8	reset/turbo	3o	1yr
Axiom 386-20	£2,295	1	1	85M	2M/8M	HERC/MON	80386-20	43x41	1ser/2par	8	reset/turbo	3o	1yr
Axiom 386-25	£3,695	1	1	122M	2M/16M	HERC/MON	80386-25	43x41	1ser/2par	8	reset/turbo	3o	1yr
Axiom 386-33	POA	1	1	122M	2M/16M	HERC/MON	80386-33	43x41	1ser/2par	8	reset/turbo	3o	1yr
Elonex (01) 437 8985													
Elonex PC-88C	£695		1	20M	640K/640K	HERC/MON	8088-V20	38.9x36.8	1ser/1par	4	reset/turbo	2HHo	
Elonex PC-88S	£745		1	20M	640K/640K	HERC/HERC	8088-10	41.9x50.8	1ser/1par/2mou	8	reset/turbo	4HHo	1yr/Hotline
Elonex System 286M	£895		1	20M	640K/1M	HERC/HERC	80286-10	40.1x40.6	2ser/1par/2mou	3	reset/turbo	2HHo	1yr/Hotline
Elonex PC-286C	£995		1	20M	640K/1M	HERC/HERC	80286-10	41.7x38.4	2ser/2par/2mou	6	reset/turbo	3HHo	1yr/Hotline
Elonex PC-286S	£1,095		1	40M	640K/1M	HERC/HERC	80286-12	44.5x54.6	2ser/2par/2mou	8	reset/turbo	3HHo/2HHc	1yr/Hotline
Elonex PC-386S/20	£1,845		1	40M	1M/9M	HERC/HERC	80386-20	44.5x54.6	2ser/2par/2mou	8	reset/turbo	3HHo/2HHc	1yr/Hotline
Elonex PC-386V/33	£3,495		1	72M	4M/8M	HERC/HERC	80386-33		2ser/2par/2mou	8	reset/turbo	3HHo/2HHc	1yr/Hotline
Epson UK (0442) 61144													
PCe	£119		1	20M	640K/640K	MDA/MON	8088-12	36.5x37.6	1ser/1par	5	reset/turbo	3o	1yr
PC AX2	£1,399		1	20M	640K/640K		80286-12	40x41.3	1ser/1par	6	reset/turbo	3o	1yr
PC AX	£1,999		1	40M	640K/640K		80286-12	49.9x42.2	1ser/1par	8	reset/turbo	3o/2c	1yr
PC AX3	£2,999		1	40M	1M/16M		80386-16	49.9x42.2	1ser/1par	8	reset/turbo	3o/2c	1yr
EuroMicro (01) 443 3400													
386/20 Base System	£999		1		1M/1M		80386-20		1ser/1par				
386/16 Base System	£949		1		1M/1M		80386-16		1ser/1par				
286/12 Base System	£749		1		1M/1M		80286-12		1ser/1par				
Everex (01) 205 0607													
Everex Step 286/12	£2,326		1	40M	1M/4M	HERC/MON	80286-12	41.7x43.5	1ser/1par	8	reset/turbo	2o/1c	1yr
Everex Step 286/16	£2,616		1	40M	1M/4M	HERC/MON	80286-16	41.7x43.5	1ser/1par	8	reset/turbo	2o/1c	1yr
Everex Step 286/20	£2,916		1	40M	1M/8M	HERC/MON	80286-20	41.7x53.6	1ser/1par	8	reset/turbo	5o	1yr
Everex Step 386/16	£3,216		1	40M	1M/16M	HERC/MON	80386-16	41.7x53.6	1ser/1par	8	reset/turbo	5o	1yr
Everex Step 386/20	£3,516		1	40M	1M/16M	HERC/MON	80386-20	41.7x53.6	1ser/1par	8	reset/turbo	5o	1yr
Everex Step 386/25	£3,816		1	40M	1M/16M	HERC/MON	80386-25	41.7x53.6	1ser/1par	8	reset/turbo	5o	1yr
Everex Step 386is	£2,816		1	40M	1M/4M	HERC/MON	80386-16	45.7x43.5	1ser/1par	8	reset/turbo	2o/1c	1yr
Everex Step 386/33	£4,316		1	40M	1M/16M	HERC/MON	80386-33	41.7x53.6	1ser/1par	8	reset/turbo	5o	1yr
Facit (0634) 83008													
Facit PC-1	£1,227	1			640K/4.6M	VGA/MON	8088-10	42.1x41.4	2ser/1par	4		2o/1c	1yr
Facit PC-2	£1,686		1		640K/1M	VGA/MON	80286-10	33.9x41.2	1ser/1par	5	reset	3o/1c	1yr
Facit PC-3	£3,485		1		2M/8M	VGA/MON	80386-20	37.7x41.8	2ser/1par	5	reset	3o/1c	1yr
Gemini (01) 734 5512													

Manufacturer & Machines	Price	Disk drives			Memory supplied/ max on board	Graphics display	CPU & speed	footprint mm	ports serial/parallel mouse	Total Expansion slots	Switches reset turbo	Drive bays open closed	Support and warranty
		3 1/2 (high density)	5 1/4	hard disk									
Gemini AT Desktop 286/8	£1,775		1	32.5M	1M/4M	HERC/MON	80286-8	43x51	1ser/1par	6		2o/2c	1yr
Gemini AT Desktop 386/16	£3,275		1	32.5M	2M/16M	HERC/MON	80386-16	48x53	1ser/1par	8		2o/2c	1yr
Gemini AT Desktop 386/25	£4,775	1	1	32.5M	1M/24M	HERC/MON	80386-25	48x53	2ser/1par	8		3o/2c	1yr
Hermes Precisa (0206) 845251													
H205	£1,799	2		20/40M	1M/16M	VGA/MON	80286-8	39.3x41.2	1ser/1par/1mou	3		2o/1c	1yr/3mth lab
H210	£2,461	1	1	20/40M	1M/16M	VGA/MON	80286-12	36x39	1ser/1par	8	reset	2o/1c	1yr/3mth lab
PC310	£4,555	1	1	80M	1M/48M	VGA/MON	80386-20	38x41	1ser/1par	7	reset	2o/1c	1yr/3mth lab
PC330	£5,255	1	1	135M	2M/48M	VGA/MON	80386-20	41x48	1ser/1par	7	reset	3o/1c	1yr/3mth lab
Hi-Grade (01) 482 4024													
Hi-Grade 386A/25	£2,495	1	1	40M	1M/16M	HERC/MON	80386-25	47.5x16x59	2ser/2par	8	reset/turbo	4o/1c	1yr
Hi-Grade 286/20	£1,495	1	1	40M	1M/8M	HERC/MON	80286-20	41x37x16	2ser/2par	8	reset/turbo	4o/1c	1yr
Hi-Grade 386SX	£1,525	1	1	40M	1M/8M	HERC/MON	80386-16	41x37x16	2ser/2par	8	reset/turbo	4o/1c	1yr
Hi-Grade 286/12	£1,295	1	1	40M	1M/8M	HERC/MON	80286-12	41x37x16	2ser/2par	8	reset/turbo	4o/1c	1yr
Hi-Grade 286/16	£1,395	1	1	40M	1M/8M	HERC/MON	80286-16	41x37x16	2ser/2par	8	reset/turbo	4o/1c	1yr
Hi-Grade 386X	£1,725	1	1	40M	1M/8M	HERC/MON	80386-20	41x37x16	2ser/2par	8	reset/turbo	4o/1c	1yr
Hi-Grade 386X/25	£1,995	1	1	40M	1M/16M	HERC/MON	80386-25	41x37x16	2ser/2par	8	reset/turbo	4o/1c	1yr
IBM (0256) 56144													
IBM PS/2 Model 30	£1,289	2			640K/640K	MCGA/MON	8086-8	40.6x39.7	1ser/1par/1mou	3	reset	2o	1yr
IBM PS/2 Model 30-286	£2,147	1		20M	1M/4M	VGA/MON	80286-10	40.6x39.7	1ser/1par/1mou	3	reset		1yr
IBM PS/2 Model 50	£2,389	1		20M	1M/1M	VGA/MON	80286-10	36x42	1ser/1par/1mou	3	reset		1yr
IBM PS/2 Model 50Z	£3,061	1		20M	1M/2M	VGA/MON	80286-12	49.2x21	1ser/1par/1mou	3	reset		1yr
IBM PS/2 Model 60	£3,511	1		44M	1M/1M	VGA/MON	80286-10	49.2x21	1ser/1par/1mou	3	reset		1yr
IBM PS/2 Model 70	£4,204	1		60M	2M/2/4M	VGA/MON	80386-25	36x42	1ser/1par/1mou	3	reset		1yr
IBM PS/2 Model 80	£4,407	1		44M	1M/8M	VGA/MON	80386-10	16.5x48.3	1ser/1par/1mou	3	reset		1yr
Locland (03552) 28808													
Locland Explorer	£1,849	1	1	20M	1M/8M	GAS/MON	80286-12	32x36	2ser/1par	1	turbo	1c	1yr/hotline
Locland 286-12	£995		1	20M	640K/4M	HERC/MON	80286-12	41x41.5	2ser/3par	8	reset/turbo	3o/1c	1yr/hotline
Locland 286-20	£1,295		1	20M	1M/8M	HERC/MON	80286-20	41x41.5	2ser/3par	8	reset/turbo	3o/1c	1yr/hotline
Locland 386-25	£2,295		1	40M	1M/16M	HERC/MON	80386-20	41x41.5	2ser/3par	8	reset/turbo	3o/1c	1yr/hotline
Mesh (01) 902 9680													
Mesh/M88A	£695	1	1	20M	640K/640K	HERC/MON	8088	40x17.5x35	2ser/2par/1mou	8	reset/turbo	2HHo/1HHc	3yrs
Mesh/M286A	£895	1	1	20M	640K/4M	HERC/MON	80286-10	40x17.5x35	2ser/2par	8	reset/turbo	2HHo/1HHc	3yrs
Mesh/M286B	£995	1	1	20M	640K/4M	HERC/MON	80286-12	40x17.5x35	2ser/2par	8	reset/turbo	3HHo/1c	3yrs
Mesh/M386A	£1,695	1	1	40M	1M/16M	MON	80386-16	40x17.5x35	2ser/2par	8	reset/turbo	3o/1c	3yrs
Mesh/M386B	£2,195	1	1	40M	1M/16M	MON	80386-20	40x17.5x80	2ser/2par	8	reset/turbo	4o/1c	
Mesh/M386C	£2,895	1	1	40M	2M/16M	HERC/MON	80386-25	40x17.5x80	2ser/2par	8	reset/turbo	4o/1c	3yrs
Mesh/M88P-2	£795	2	2		640K/640K	LCD/BL	Intel 8088	40x20x20	2ser/1par	6	reset/turbo	2o	3yrs
Mesh/M286P-20	£1,295	1	1	20M	640K/4M	LCD/BL	80286-10	40x20x20	2ser/1par	6	reset/turbo	2o	3yrs
Mitac (0952) 607022													
MPS 1000P	£679		1			MDA/MON	8086-30	35.5x42	1ser/1par/1mou	5	reset/turbo	3o/1c	1yr
MPS 2386	£2,499	1		40M	640K/4.64M	VGA/MON	3086SX-16	33.7x42.1	1ser/1par/1mou	6	reset	3o/1c	1yr
MPC 2386	£1,999		1	20M	1M/8M	VGA/MON	80386SX-16	33.7x42.1	2ser/1par	6	reset	3o/1c	1yr
MPC4000F	£3,799		1	40M	20M/8M	HERC/MON	80386-25	23x48	2ser/1par	8		4o/2c	1yr
MPC4000E	£3,799		1	40M	1M/8M	HERC/MON	80386-20	23x48	2ser/1par	8	turbo	4o/2c	1yr
MPC2100V	£1,299		1	20M	1M/8M	VGA/MON	80286-12	37.7x42.1	1par	6	reset/turbo	2o/1c	1yr
MPC2100VE	£1,999		1	20M	1M/8M	VGA/MON	80286-16	37.7x42.1	2ser/1par	6	reset/turbo	3o/1c	1yr
MPC2000SL	£1,099		1		640K/1M	CGA/PLAN/MO	80286-10		1ser/1par	5		3o/1c	1yr
MPC3100E	£2,699		1	40M	2M/8M	HERC/MON	80386-20	37.7x41.8	2ser/1par	5	reset	3o/1c	1yr
Normrel (0737) 370717													
ATC 12	£2,412	1	1	20M	1M/2.64M	RC/CGA/EGA/	80286-12.5	39.8x37.7x9.5	2ser/1par/1mou	3	reset	2o	1yr
ATC 386SX	£3,079	1	1	40M	1M/2M	RC/CGA/EGA/	80386SX-16	39.8x37.7x9.5	2ser/1par/1mou	3	reset	2o	1yr
ATC 386	£3,841	1	1	40M	1M/2M	RC/CGA/EGA/	80386-20	39.8x37.7x3.5	2ser/1par/1mou	3	reset	2o	1yr
NS 30	£1,746	1	1	20M	1M/2M	RC/CGA/EGA/	NEC V30-10	39.8x37.7x9.5	1ser/1par/1mou	3	reset	2o	1yr
NS 50	£3,079	1	1	40M	1M/2M	RC/CGA/EGA/	80286-16	39.8x37.7x10.3	1ser/1par/1mou	3	reset	2o	1yr
NS 65	£3,365	1	1	40M	1M/2M	RC/CGA/EGA/	80386SX-16	39.8x37.7x10.3	1ser/1par/1mou	3	reset	2o	1yr
NS 70	£4,404	1	1	80M	1M/2M	RC/CGA/EGA/	80386-20	39.8x37.7x10.3	1ser/1par/1mou	3	reset	2o	1yr
NTS (0368) 64452													
Next VM32	£999		1	32M	1M/1M	VGA/MON	8088-12	36x40.5	2ser/2par/1mou	8	reset/turbo	4o	1yr
Next 286	£1,181		1	32M	1M/8M	HERC/MON	80286-12	19x28	2ser/2par/1mou	6	reset/turbo	3o/1c	1yr
386SX	£1,457	1	1	32M	1M/8M	HERC/MON	80386-20	19x28	2ser/2par/1mou	6	reset/turbo	3o/1c	1yr
386 NE	£1,772	1	1	32M	32M/8M	HERC/MON	80386-20	19x28	2ser/2par/1mou	6	reset/turbo	3o/1c	1yr
Next 10	£630		1		1M/1M	HERC/MON	8088-12	36x40.5	2ser/2par/1mou	8	reset/turbo	4o	1yr
Olivetti (01) 785 6666													
Olivetti P500 PC	£2,423	1		40M	1M/4M	VGA/EGA/CGA/	80386SX-16	42.5x40.5	1ser/1par/1mou	5	reset	2o/2c	9mths
Olivetti M300	£2,498	1	1	40M	1M/4M	VGA/EGA/CGA/	80386SX-16	38.5x39.4	1ser/1par/1mou	8	reset	2o/1c	
Olivetti M200	£840	2			640K/640K	CGA/MON	8086-8	39x33	1ser/1par	2	reset	2o/1c	9mths
Olivetti M250	£1,799	2			1M/640K	EGA/VGA/CGA/	80286-8	37x39	1ser/1par	7	reset	2o/1c	9mths
Olivetti M290	£2,431		1	20M	1M/4M	EGA/VGA/CGA/	80286-12	36x39	1ser/1par	8	reset	2o/1c	9mths
Olivetti M380	£3,340	1	1	62M	1M/4M	VGA/EGA/CGA/	80386-16	38x41	1ser/1par	7	reset	2o/1c	9mths

Manufacturer & Machines	Price	Disk drives			Memory supplied/ max on board	Graphics display	CPU & speed	footprint mm	ports serial/parallel/ mouse	Total Expansion slots	Switches reset turbo	Drive bays open closed	Support and warranty
		3 1/2 (high density)	5 1/4	hard disk									
Opus (0737) 765080													
PCIII Turbo	£549		1	30M	256K/1M	DA/CGA/HERC	8088		1par/1ser/1mou	8			1yr
PCIV 286	£1,199	1	1	20M	1M/1M	MDA/HERC	80286-16		2ser/1par	3			1yr
PCV Turbo	£1,295	1	1	30M	1M/1M	VGA/HERC/M	80286-16		1par/1ser/1mou	5			1yr
PCVI Turbo	£1,999	1	1	60M	1M/4M	VGA	80286-16		2ser/1par	7			1yr
PCV 386	£1,999	1			1M/16M	DA/CGA/HERC	80386-32		2ser/1par	8			1yr
PC7 Turbo Cache	£3,999	1	1		4M/16M	ERC/VGA/CG	80386-32		2ser/1par	6			1yr
Phillips (01) 689 2166													
NMS9110		2			768K/768K	CGA/EGA/MON	8088-2-8	3.65x40x14	1ser/1par	5			
NMS9115		1		20M	768K/768K	CGA/EGA/MON	8088-2-8	3.65x40x14	1ser/1par	5			
NMS9120		1			640K/640K	VGA/EGA/M	80286-8/10	3.65x40x14	1ser/1par	5			
Samsung (01) 391 0168													
S5200	£2,499		1	32M	1M/4M	EGA	80286	37x38.2	1ser/1par/1mou	2	turbo		1yr
Sanyo (0923) 46363													
Sanyo MBC-16	£742		1		640K/640K	VGA/VGA col	8088-10	34x34	1ser/1par	3	reset	1o	1yr
Sanyo MBC-17	£1,243		1		1M/1M	GA/HERC/MC	80286-12	33.7x41	1ser/1par	6	reset	2o	1yr
Sanyo MBC-18	£2,143		1		1M/1M	GA/HERC/MC	80386-16	33.7x41	1ser/1par	6	reset	2o	1yr
Sanyo MBC-18.5	£2,439		1		1M/1M	GA/HERC/MC	80386-20	33.7x41	1ser/1par	6	reset	2o	1yr
Sanyo MBC-18t	£3,395		1		1M/1M	GA/HERC/MC	80386-20	24x48	1ser/1par	12	reset	5o	1yr
Screens (09274) 20664													
Screens ST100	£399		1		640K/1M	HERC	8088	35.5x40	1ser/1par	8	reset	3o	1yr
Screens ST200	£799		1	30M	1M/1M	HERC/MON	V20-12	18x41	1ser/2par	8	reset/turbo	4o/1c	1yr
Screens ST300	£1,299	2	2	20M	1M/1M	EGA/EGA	80286-8.6	35.5x40	1ser/1par	8	reset	2o/1c	1yr
Screens ST330	£899		1	30M	640K/1M	HERC	80286	35.5x40		8	reset	4o	1yr
Screens ST400	£1,695	2	2	60M	1M/8M	HERC/MON	80286-20	42x42	2ser/1par	8	reset/turbo	2o/1c	1yr
Screens ST500	£1,495		1	30M	2M/1M	HERC	80286	35.5x40	1ser/1par	8	reset	4o	1yr
Screens ST700	£1,795		1	30M	2M/1M	HERC	80286	35.5x40	1ser/1par	8	reset	4o	1yr
Silver Reed (0923) 35616													
Super 286C Hyundai	£1,351		1	30M	640K/1M	HERC/MON	80286-10	40.5x42.1x16.1	1ser/1par	6		2o/1c	
Super 386C Hyundai	£2,595			40M	1M/8M	VGA	80386-20	40.5x42.5x15.7	1ser/1par/1mou	6	reset/turbo	3o/1c	
Super 16TE Hyundai	£640		1		640K/640K	HERC/MON	8088-1	38.1x39.6x14.3	1ser/1par	4		2o	
Tandon (0527) 46800													
PCX 20	£1,149		1	20M	640K/640K	HERC/MON	8088-4.77	38.5x48	1par	5			1yr
PCA12SL-SF	£999		1	40M	640K/1152K	HERC/MON	80286-8/12	46.5x40.6	2ser/1par	4			1yr
PCA 12 SF	£1,699		1	70M	1M/1M	HERC/MON	80286-8/12	16x41.5	1ser/1par	5			1yr
PAC 286/12	£1,999		1	80M	1M/1M	HERC/MON	80286-12	39.9x16	1ser/1par	5			1yr
PAC 386 SX	£2,599		1	30M	1M/8M	HERC/MON	80386-16/8	39.9x16	1ser/1par	5			1yr
386/16-SF	£2,599		1	40M	1M/8M	HERC/MON	80386-16/8	3.3x41.5	1ser/1par	8			1yr
386/20-SF	£2,999		1	110M	1M/8M	HERC/MON	80386-20/8	16x41.5	1ser/1par	8			1yr
386/25-SF	£4,699		1	300M	1M/16M	VGA/COL	80386-25/8	16x41.5	1ser/1par	7			1yr
386/33-SF	£5,499		1	300M	1M/16M	VGA/COL	80386-33/8	41.5x53.5	1ser/1par	7			1yr
Tulip (0293) 562323													
Tulip PC Compact 2	£795		2		640K/640K	GA/HERC/MC	V20-10	30.5x37.5	1ser/1par/1mou	5		2o/1c	1yr
Tulip AT Compact 2	£1,145		2		1M/1M	GA/HERC/MC	80286-12.5	30.5x37.5	1ser/1par/1mou	5		2o/1c	1yr
Tulip AT-386SX	£2,395	1	1	40M	1M/5M	GA/HERC/MC	80386-16	38.5x43	2ser/1par	8		2o/1c	1yr
Tulip AT 386/25	£3,995	1	1	40M	1M/4M	GA/HERC/MC	80386-25	38.5x43	2ser/1par	6		2o/1c	1yr
Tulip tr 386/25	£6,395	1	1	160M	4M/4M	GA/HERC/MC	80386-25	15.2x46	2ser/1par	6		4o/3c	1yr
Tulip tr 386sx		1	1	80M	1M/4M	GA/HERC/MC	80386-25	15.2x46	2ser/1par	6		4o/3c	1yr
Victor (0494) 461600													
V86P	£999	1			640K/640K	CGA	PCXT		2ser				1yr
V286C	£999	1	1		640K/1M	CGA/EGA/MON	80286	13x38x39.3	1ser/1par/1mou	4	reset	2HHo	1yr
VPCIIIC	£949	1	1		640K/640K	OL/HERC/MC	8086PCXT	13x38x39.3	1ser/1par/1mou	3	reset	2HHo	1yr
V286A	£2,099	1	1	30M	1M/1M	HERC/MON	80286	15x44x43.5	1ser/1par	6	reset	2HHo	1yr
V286P	£2,499	1		30M	1M/3M	CGA/MON	80286		1ser/1par/1mou	1			1yr
V386A	£2,999	1	1	50M	1M/16M	HERC/MON	80386	15x44x43.5	1ser/1par	6	reset	2HHo	1yr
V286S	£2,499	1	1	50M	1M/1M	HERC/MON	80286	15.2x55.3x43.2	1ser/par	8	reset	2HHo/1c	1yr
V386S	£3,299	1	1	50M	2M/16M	HERC/MON	80386	15.2x55.3x43.2	1ser/1par			2HHo/1c	1yr
V386T	£5,999	1	1	70M	2M/16M	HERC/MON	80386		2ser/1par	8		3HHo/3HHc	1yr
Wells American (0494) 448874													
CompuStar II	£2,330	1	1	42M	1M/8M	VGA	286-20	4.6x16.2x16.3	2ser/1par/1mou	11	reset	3o/1c	1yr
Wyse Technology (0734) 342200													
Wyse pc 286 Model 2108	£1,115		1		512KB/16M		80286-8	38.1x42.2	1ser/1par	5	reset/turbo	2o/1c	1yr
Wyse pc 286 Model 2112	£1,435		1		1M/16M		80286-12.5	38.1x42.2	1ser/1par	5	reset/turbo	2o/1c	1yr
Wyse pc 286 Model 2116	£1,595		1		1M/16M		80286-16	38.1x42.2	1ser/1par	5	reset/turbo	2o/1c	1yr
Wyse pc 386 Model 3216	£2,295		1		1M/16M		80386-16	53.7x44.7	2ser/1par	6	reset/turbo	4o/1c	1yr
Wyse system 386 Model 322	£4,995		1		4M/16M		80386-25	53.7x44.7	2ser/1par	6	reset/turbo	4o/1c	1yr

STOP WASTING MONEY

CALL US!



P~~OUND~~BUSTERS

WE WILL SUPPLY IT! WHATEVER IT IS! AT THE BEST PRICE AROUND!

OPUS	OLIVETTI	HEWLETT PACKARD	EPSON	STAR
ZENITH	TOSHIBA	AMSTRAD	SCHNEIDER	M3 IPC
MICROSOFT	LOTUS	SAGE	VENTURA	& MANY MORE

- | | |
|---|---|
| Q What do you supply? | A Whatever other people manufacture! |
| Q When can you deliver? | A As soon as is humanly possible! |
| Q How do you keep your prices so low, but still manage to provide such a good after sales service? | A That's what our competitors would love to know! |
| Q I need my widget tomorrow, but I haven't an account, can you supply it? | A No problem! |
| Q I'm not sure what I need, can you help? | A We can get an independant consultant to help you decide. FREE! |
| Q Why don't you publish your stock prices? | A Because it would cost YOU more money! |

But there are some example prices to whet your appetite.

Epson LX-800 £150, Star LC10 £150, Opus PCIII/20 - £825, Opus PCIV - £1115, Sanyo Portable - £699, Schneider DTP package, inc 12.5 MHz AT, 65 Mb HD, 14" EGA, Laser printer & software (Timeworks, + Works) £2599.

ALL UK STOCK. NOT W. GERMAN!

All computers sold with MS-DOS 3.3 or Higher.

Maintenance Contracts Available On ALL Equipment

Beware Of The Box Shifters. Call The Professionals Now!

THE GREAT WESTERN TRADING Co

18/18A BATH STREET, FROME (0373) 62232

FOR THE BEST DEAL AROUND

All prices ex VAT & delivery, while stocks last. All trade marks recognised.



Text Expectations

What should you expect from the modern word processor? Peter Worlock investigates.

Among those people with more than a little knowledge of computers there is a recognition that software comes in different degrees of complexity. There are the truly difficult, specialised applications, like communications and CAD. Then there are the Big Three: database, spreadsheet and word processing, of which the first two are usually reckoned to be at least a little bit difficult. After all, there are flat-file databases, and relational databases, and programmable databases, and now we have three-dimensional spreadsheets, and very sophisticated macro languages. Word processing, says the common wisdom, is easy. You just type in your text, and print it out.

It is doubtful whether that simplistic view was ever true, but today it is far from accurate. The modern PC word processor is as powerful, flexible and complicated as any other software application. And in some respects it can be harder to learn: most users will approach a spreadsheet with caution because they expect it to be outside their normal experience. But with word processors — well, everyone knows how to write, don't they?

Anyone approaching, say, Microsoft Word 5 with this attitude is in for a shock when 13 floppy disks and 1200 pages of documentation come tumbling out of the box.

Much of this complication is due to a common trend in most software applications: the increasing overlap with other, separate programs. For example, one of the great attractions of Lotus 1-2-3 was that it not only did spreadsheets but added features for charting and database. Many databases now offer charting and spreadsheet functions. So it should come as no surprise that word processors are following the fashion, muscling in on territory that was once the exclusive preserve of specialist programs, like outliners and desktop publishing packages.

The result is that PC-pushing authors have never had it so good. The best of today's software offers genuine power in all areas, from organising your ideas, to editing the text, from designing the appearance of a document, to getting the best output.

Yet in another sense things have never been tougher — picking your way among a welter of features to find the software that best suits your needs is a daunting prospect. And the learning curve for these new packages is in danger of reaching the vertical — part of the Word 5 documentation is a separate leaflet explaining how to use the documentation.

THE BASICS

In the face of this burgeoning complexity it is

easy to overlook the fact that word processors still have one prime purpose: to get words into the computer and thence onto paper.

All word processing packages provide the bare essentials: word wrap, adjustable margins and page length, variable line spacing, and so on. Things start to break down when you reach the stage of editing text. Moving around a document is a fundamental requirement, but many programs are surprisingly limited in this respect. The best provide ways of moving forward and backward by character, word, line, sentence, paragraph, screen and page, as well as providing direct 'jump to page' facilities.

Although many users view the mouse as an irritating distraction when creating text, it can be an extremely useful tool during editing so optional mouse support is a welcome feature in a word processor.

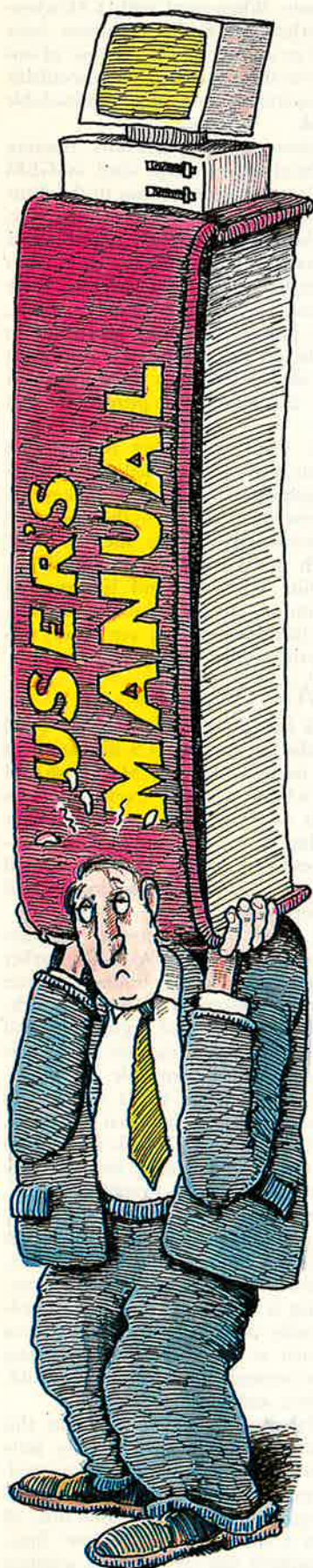
Selecting text on which various actions can be performed is another bug-bear. One of the best keyboard systems is provided by Word 5 which uses the same keys as for moving around the document in conjunction with Shift. This allows any unit of text, from a single character to multiple paragraphs to be selected quickly and easily.

At the other end of the scale are programs like Wordstar which require a separate text-selection mode, and use arcane command-key sequences: CTRL-KB to mark the beginning of a selection; CTRL-KK to mark the end, and then a further CTRL-K command to achieve the desired effect. Putting these kinds of commands into a menu might make them easier to use, but they are no less irritating, or more intuitive.

Now also classed among the 'essentials' are the two most common writer's tools: the spelling checker and the thesaurus. Both are well-supported by all of the leading programs (although it is worth watching for the inclusion of American dictionaries, especially in new releases which may have been rushed to market).

Spelling checkers, however, still fall some way short of ideal. It is irritating to have the program constantly querying simple plurals when it readily accepts the singular version. Many checkers, for example, will accept 'single' but object to 'singles'. Possessive word endings pose similar problems.

Despite some activity in specialised programs, none of the current best-sellers offers more complex help, such as checking for acceptable style, correct grammar, and so on. Doubtless future versions will add such facilities as the remorseless quest for features continues.



An important consideration in the area of basic features, though one that is hard to quantify, is the question of 'look and feel'. Much of WordPerfect's success is attributable to its very clean display, uncluttered by visual effects, menus and complex status lines. Yet at the same time, the success of the Macintosh in terms of ease-of-use has demonstrated the attractions of at least some 'clutter' — pull-down menus, dialog boxes, and so on.

Like clothes, cars and keyboards, word processors are very much an area of personal taste — how else is one to explain the fact that Samna Word, XyWrite and DisplayWrite have made at least some sales.

Finally, the question of output is of such crucial importance that the fact that it is so often overlooked is simply astonishing. The most feature-laden word processor is all but useless if it falls at the final obstacle of actually printing the document. What price a program that offers on-screen typographical control, multiple fonts, graphics and a host of other features, if the only way to print the document is to accept output geared for a basic 9-pin dot matrix printer?

Happily, this situation has improved considerably with most current programs supporting a tremendous range of printers. WordPerfect, Wordstar and Word, for example, offer direct support for literally hundreds of different models.

However, a new pitfall is exemplified by Word 5 which is so closely linked to printer control that many facilities depend on the capabilities of the printer. This means that if you use a low-cost dot matrix model for draft proofs, and a PostScript laser printer for final copies, you need to maintain two versions of the document.

THOUGHT PROCESSING

Although any word processor worthy of the name will offer a good variety of tools to help in the creation and editing of text, it is surprising that the preceding stage of writing — organising the thoughts and ideas behind the document — has been largely ignored.

Outliners are specialised tools for just this purpose. Based on the simple concept of headings, sub-headings, sub-sub-headings etc, an outliner almost forces you to correctly structure a document (programmers will instantly recognise top-down modular design at work). As you expand on the ideas contained at each level, the document almost writes itself.

Some journalists and authors — whose work emphasises content more than appearance since the end result will be processed through a typesetter anyway — are choosing them in preference to a word processor.

Almost all writers, whether creating a memo or the company annual report, can benefit from using an outliner, but most programs are inadequate when it comes to the questions of document formatting and presentation. This means an irritating intermediate stage of exporting the text from the outlin-

er to the word processor, or — more often — the writer foregoing the benefit of the outliner altogether.

Word 5 and Manuscript stand out from the crowd by offering built-in outliners that smoothly integrate the different stages of organising a document, writing it, then formatting it.

LOOK, NO HANDS

The fundamental promise of word processing has always been that it makes the process of writing physically easier (the intellectual effort ought to be unchanged). Unfortunately, too often that has boiled down to the single advantage of not having to re-type page after page simply to correct a few typing errors.

The current generation of programs delivers genuine power via four sophisticated features: mail merge; macros; style sheets; and glossaries.

Mail merge — the ability to insert data, usually names and addresses, from a database file into a standard document — is undoubtedly the most familiar of these, having been available on many word processors for several years. This feature alone can claim much of the credit — or blame — for spawning the direct mail industry.

Macros are also familiar, although less so in the field of word processing. When WP programs offered few features there was little need for a facility that automated their use. But with the modern word processor there is ample scope for macros to reduce key-bashing to a minimum.

Macros are usually available in two flavours, sometimes combined within the same package. The first type is a simple recorder: you turn on the macro, type the necessary commands, then turn off the macro. This sequence of keystrokes is then assigned to a single function key, or control-key combination and can then be instantly and automatically replayed when needed. Possible uses include often used formatting command sequences.

The second type of macro is more powerful and incorporates a mini programming language. Sequences of commands allow macros to accept input from the user, evaluate the input, make IF . . . THEN . . . ELSE decisions, and repeat actions in loops.

The style sheet is a concept borrowed from desktop publishing and allows more or less precise control of the appearance of text. At the most sophisticated level, styles include typeface, such as Times Roman, a printing style, such as bold and italic, and size, line spacing, paragraph indents and tab settings, and formats like justification or centring.

Libraries of such styles can be created and stored under appropriate names, like Main Headings, Body Text, Captions, Tables. Thereafter, the named style can be applied to selected text with a single style replacing perhaps dozens of keystrokes or menu selections. WordPerfect is strong in this respect; its style sheets can also contain text, headers, foot-

ters and so on. Wordstar has just added style sheets, in version 5.5, but they are largely restricted to page formatting and font selection.

Finally, glossaries are libraries of commonly-used blocks of text such as letter-heads, standard letter endings, or specialist phrases like 're yours of the 1st inst' or 'trichlorofluoroethylene'. Again, a single key command or mouse selection results in the appropriate phrase being typed automatically into the document.

Used in conjunction, these tools allow entire tasks to be automated. It is theoretically possible, for example, in Word 5 to set up, type, format, sort by postcode and print out a 5,000 item mailing list at the press of a single command-key.

Other, more specialised, facilities are also increasingly commonplace. Many of these are aimed at academic and technical authors and include features like the automatic creation of tables of contents, indices, cross references, and numbered footnotes.

PRESENTATION IS ALL

Certainly the most striking improvements in the current crop of word processors are the features borrowed from desktop publishing — notably graphics handling, and vastly improved typographical control.

This is excellent news for users since in many cases it eliminates the need for a separate DTP package costing several hundred pounds. Although no WP software can currently match Pagemaker or Ventura in terms of flexibility and precision, any of the top programs — Wordstar 5.5, WordPerfect 5 or Word 5 — is capable of producing reports, leaflets, manuals and newsletters of a sufficiently high quality to satisfy most everyday business needs. Indeed, the current versions of WordPerfect and Word are more powerful, and support more features, than the first Macintosh DTP programs of just a few years ago.

Most top packages can also import charts and other graphics from a variety of PC software. Just as important is the ability to edit those images once they have been placed in the document, but here most software falls a long way short of perfection. Often the only facility available is to re-size the image, with proportionate scaling, whereas features like the ability to crop unwanted areas, and to enlarge and shrink selected portions of the image, would be welcome.

In typography, the better packages are now capable of displaying newspaper-style, multiple-column pages, and of using a variety of typefaces and styles (beyond the commonplace bold, italic and underline), and of mixing type in different sizes. However, there are many different ways of achieving these ends.

Word 5, for example, is once again dependent on the capabilities of the printer being used. With a humble 9-pin dot matrix device, typography is very limited, usually to the single letter-quality font provided by the prin-

ter manufacturer. When used with a Hewlett-Packard LaserJet, or similar business laser printer, Word recognises and makes use of not only the built-in fonts but also those available on plug-in cartridges and as downloadable fonts from disk.

By comparison, word processors running under a graphical environment such as GEM or Windows have automatic access to the fonts provided by those environments. Often, this selection will be greater than that available to a similar program running under DOS, but there is a penalty to be paid: because these programs operate in the PC's graphics mode, and force the printer to do the same, screen updates and the actual printing of a document will be much slower than in a word processor driving both computer and printer in text mode.

Perhaps the major remaining omission in this department is the lack of facilities for fine-tuning the appearance of type. Two key requirements here are kerning — the ability to close up awkward letter-pairs such as 'VA' and 'fi' which normally have too much intervening white space — and line-spacing where the common choices of single, double, or one-and-a-half line spacing are totally inadequate for professional-quality type.

WHAT YOU SEE . . .

One drawback that most state-of-the-art word processors suffer on the PC is a limitation of the hardware itself. Unlike the Macintosh and the Amiga which operate exclusively in graphics mode — treating text as just another form of graphic — the PC was originally designed as a text-based system. Until the arrival of VGA, the PC's graphics modes looked and felt like an afterthought.

As a result, most word processing software used text mode exclusively. With the earlier programs, this wasn't a real limitation since text was all they concerned themselves with, but the introduction of varied typography and graphics into word processing has made text mode almost completely unsuitable.

Against this, text mode has a number of advantages, not least the fact that programs operating in text mode are much faster, and the same document will occupy less memory and disk space in text than in graphics mode.

For these reasons, most packages continue to operate predominantly in text mode. In Wordstar, Borland's Sprint, and WordPerfect, all text creation and editing is done this way. Any formatting is indicated either by embedded control codes or by the use of on-screen text effects such as inverse video, and using one colour for normal text, a second for bold, a third for italics, and so on.

The literally obvious drawback with this system is that you can't see precisely how your document will look until it is printed. Any problems require further cycles of editing/printing/editing. To overcome this, all packages offer a special 'print preview' function which employs one of the PC's graphics

Beautiful faces at pretty special prices

See us at the
Personal Computer Show
Stand No. 2446



The beauty of Typografica faces will add impact and professionalism to your desktop publishing – and it's more than skin deep.

Typografica can generate GEM/3*, Windows* or HP Soft Fonts* in an almost unlimited range of point sizes and is fully compatible with popular publishing packages such as Ventura*, Pagemaker* and Timeworks Publisher*.

At prices from just £29.00 (excluding VAT), Typografica offers pretty special value too. Appreciate the true beauty of Typografica at your local dealer or 'phone 0480 496666 for further information.

TYPOGRAFICA®
The new face of desktop publishing

Typografica® is published by GST Software Products Limited and distributed in the UK by Electric Distribution, Meadow Lane, St Ives, Cambs PE17 4LG. Tel: 0480 496666 Fax: 0480 496189.
*All registered trademarks acknowledged.

No. 1 GREAT NEWS FOR PRINTER USERS!



★★★★ PRINTMASTER ★★★★★

Printer Buffer with Typewriter action and Data Switch!

Features:

64K PRINT BUFFER — A 32 page memory with Copy, Pause, and Clear switches, frees your PC for other work whilst printing documents, Copy gives repeat printouts.

TYPEWRITER MODE — Use your Keyboard and Printer like a Typewriter, without disturbing the work on your VDU. Simply switch between normal and Type mode as you please. Ideal for envelopes, labels, forms, memos and other quick print jobs.

DATA SWITCH — Connect 1 PC to 2 Printers or 2 PC's to 1 Printer. Manual or Auto switching.

UTILITIES — Text Editor, Code Conversion.

No fuss! simply connect between your keyboard and PC cables.

£159

Available for PC/XT/AT/PS/2's PC1512/1640 and compatibles.

Free P&P (UK), plus full Guarantee.

Tel: 01-790-2424,

Comp-u-Link, Wickham House, 10 Cleveland Way, London E1 4TR

HARTEC HT SERIES

● HIGH PERFORMANCE COMPUTERS



HT 386-20£1480.00
80386-20 CPU, Zero Wait State RAM.
Up to 8 Meg on Motherboard, 1 Meg fitted. 1.2M or 1.44M Floppy, 20M Hard Disk. Norton SI = 21.3. Supports LIM 4.0 when used with MS DOS 4.xx.

HT 286-16£998.00
80286-16 CPU, Zero Wait State. Up to 4 Meg on Motherboard, 1 Meg fitted. 1.2M or 1.44M Floppy, 20M Hard Disk. Norton SI = 18.2. Supports LIM 4.0

HT 286-12£850.00
80286-10 CPU, running at 12 MHz. Up to 4 Meg RAM (Zero Wait State) on Motherboard. 512k fitted. 1.2M or 1.44M Floppy and 20M Hard Disk. Norton SI = 13.7. Supports LIM 4.0

The Prices include —
12 Months warranty
7 or 8 expansion slots
101 key UK keyboard
Maths co-processor socket
12" Amber Monitor
1 or 2 parallel and 2 serial ports.

HARTEC 505 BRISTOL ROAD
BIRMINGHAM B29 6AU FAX: 021-4464267

TEL: 021-4141377

Prices exclude VAT and Carriage

SOME TYPICAL OPTIONS
Upgrade to 44M 28MS Disk£140.00
369k Floppy Drive£59.00
14" VGA & 16 Bit Card£380.00
MS DOS 4.01£75.00
MS DOS 3.3£65.00

Affordable

NEW ADVANCED TECHNOLOGY

modes to recreate the finished document on screen. Some are better at this than others: Wordstar, for example, is outstanding in this respect; among other features it allows the viewing of one page, facing pages, multiple 'thumbnails', or portions of text at 200 and 400 per cent magnification.

However, this is still only a partial solution. Without a very high-resolution display, text is almost always unreadable in this preview mode, and it still requires a lot of toggling between editing and preview modes to get a document looking right.

Perhaps the best solution currently on offer is provided by Word 5 which allows editing in both text and graphics modes. The former provides a fast way of writing and editing, before switching to graphics mode allows a full-size display of portions of the page showing typographical effects. These can then be altered with the results immediately visible. Finally, there is a traditional preview mode which displays complete facing pages.

A more promising solution is provided by Samna's Ami. Running under Windows, Ami is strikingly similar to Macintosh word processing, allowing full editing in a true WYSIWYG display. Unfortunately, it is lacking in many other respects, omitting a thesaurus and macros, for example. Similar benefits should be available from WP software running under OS/2 eventually, although again, sadly, the first generation of products, including WordPerfect 5 for OS/2, and DisplayWrite 4/2, do not deliver since they do not use Presentation Manager.

LOOKING AHEAD

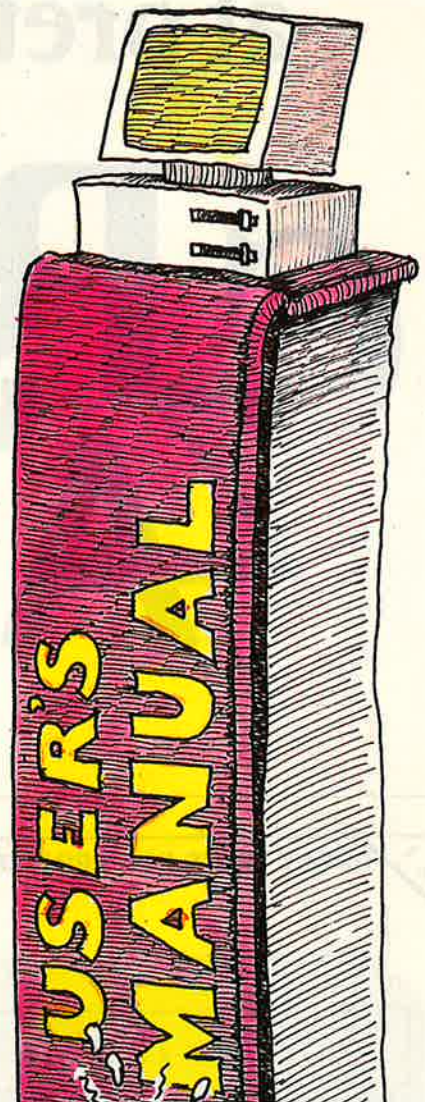
In the face of the newest products, it can be difficult to see where there is room for improvement — but that room exists.

Perhaps the single greatest requirement at the moment is a way of making products easier to use without sacrificing any of the functionality. It ought to be clear that piling on explanation after explanation in the manuals is not the solution. Any user could be forgiven for fleeing in terror when confronted by the mountainous documentation accompanying the current leaders.

Although the WIMP interface, exemplified on the PC by Windows and Presentation Manager, offers a partial solution, it isn't enough. The famed Macintosh user-friendly interface is already breaking down under the burden of feature-packed programs. A pull-down menu with nearly 100 entries (a genuine feature of one Macintosh word processor) isn't actually any easier to use than a printed list of 100 command-key 'shortcuts'.

It may be that while most PC users are just beginning to see life beyond the command-line interface, its replacement — the WIMP — is already outmoded. But certainly a standard graphical environment is required — the current advances in WP typography, and the trend towards DTP-type features, demand it.

A further advantage provided by such an



integrating environment, and one that the next generation of word processors will require, is demonstrated by the Macintosh and Amiga, for example. That is simply the need to remove printer support from the application and make it the responsibility of the operating system or environment.

The question of WP print support simply doesn't arise on the Macintosh because the Mac itself ensures that any application will be able to take full advantage of the printer attached, regardless of whether that is a 9-pin dot matrix ImageWriter or a 300dpi PostScript imagesetter.

Beyond these specifics, the trend is doubtless one of 'more of the same, but better': better spell checkers that offer additional style and grammar checking; more and better typographic control; more and better graphics support.

The exception, on the current evidence, appears to be documentation, where instead of 'more and better' we are simply getting 'more and more'. The 3,000-page manual cannot be far away.

Small businesses
Self-employed
Doctors, Accountants
Personal Finances
Clubs etc. etc.

MONEY MANAGER PC

Be your own accountant!

Control your finances professionally!

£49.95

The MONEY MANAGER system, with over 20,000 existing users, has proven itself to be the ideal accounting and book-keeping program both for personal use and for businessmen and professionals who find that traditional accounting packages are far too complicated and unwieldy for their requirements.

MONEY MANAGER PC includes features such as pop-up calculator, macros, scrolling report screens, help windows, graphics etc., increasing even further its renowned ease of use, flexibility, speed, analytical power and straight-forward usefulness. Good program design means that an unparalleled range of features is available to you without complication.

- ◆ All options selectable from the main menu
- ◆ Any number of data files- personal- business etc.
- ◆ 12 months of accounts per file, with up to 500 entries/month
- ◆ Move file forward by a month at a time when required
- ◆ Up to 20 user-defined accounts (banks, cash, cards, etc.)
- ◆ Up to 50 user-defined classes of income/expenditure
- ◆ Arrange classes into logical groups for powerful analysis
- ◆ Design classes to suit your own special environment
- ◆ Up to 50 user-defined "marks" for extra report selectivity
- ◆ Fast and natural data entry - like adding lines to a statement
- ◆ Optional reference (up to 6 characters) for each entry
- ◆ Your own descriptive text (up to 18 characters) for each entry
- ◆ Your codes are displayed on the screen during data entry
- ◆ Add, modify or delete existing items at any time
- ◆ Quick insertion of regular entries/standing orders
- ◆ Sort entries into date order at the press of a key
- ◆ For any report specify account, class, group and/or mark
- ◆ Detailed statements, item by item, for any range of months
- ◆ Totals for each class of transaction for one or more months
- ◆ Spreadsheet-type table showing class totals for each month
- ◆ Reports may be for consolidated class groups
- ◆ Report showing class totals for each account
- ◆ Account statistics - monthly max, min, average balances etc.
- ◆ Bar charts for up to four selected categories of entry
- ◆ Pie charts for up to 20 selected categories of entry
- ◆ Report of monthly income, expenditure and cash-flow

- ◆ Report of account and class totals (eg profit & loss etc.)
- ◆ Automatic calculation of VAT (with multiple rates if required)
- ◆ Detailed VAT reports showing taxable, VAT and gross amount
- ◆ Summary VAT statements in same format as VAT return
- ◆ Simply ignore VAT features if they are not required
- ◆ Detailed bank statement reconciliation with running balance
- ◆ Budget and cash-flow forecasts - may be updated
- ◆ Print any report on your Matrix, Daisy or Laser printer
- ◆ Print any report to a file for subsequent word-processing
- ◆ Data search facility to find "lost" items
- ◆ Built-in text line editor for data entry
- ◆ Full vertical and horizontal screen scrolling of reports
- ◆ Pop-up five-function multi-line calculator with memory
- ◆ Macros to record and play back key-stroke sequences
- ◆ Context-sensitive help windows appear at the touch of a key
- ◆ User-configurable screen colours
- ◆ Automatic creation of data file back-up copies
- ◆ Select your own preferred colours (colour monitors)
- ◆ Works on all PC compatibles (384k RAM needed)
- ◆ Works with single floppy, double floppy or hard disc systems
- ◆ Alternative 3.5" disc format available at no extra cost.
- ◆ Works with Hercules, CGA, EGA, VGA etc.
- ◆ Works with Microsoft or Amstrad compatible mouse
- ◆ Comprehensive 60 page indexed manual
- ◆ Two sample sets of data on disc for initial practice
- ◆ Free and indefinite telephone support

**Connect
Software Ltd.**

To receive your copy of **MONEY MANAGER PC** by return first class post, either send a cheque or phone quoting your **Visa, Access or American Express** card number. Monday-Sunday, 8am-10pm. Price includes VAT & postage.

3 Flanchford Road, London W12 9ND. Tel.: 01-743 9792



AutoCom

A revolutionary software package which has the unique capability to share remote disks and printers from within an application.

You can transfer files and utilize full networking facilities between remote sites without even acknowledging the presence of modems.

No need to learn scripts or languages, use DOS and enter the world of remote communications - without hassle.

AutoCom - for AUTOMATIC COMMUNICATION
Price - £149 (plus VAT) for two copies

Phone - 0422 330573

Applied Knowledge Limited,
Dean Clough Business Park,
Halifax, HX3 5AX, West Yorkshire

Please send me more information on AutoCom

Name.....

Company.....

Address.....

Postcode Phone.....



Word Extras

How useful are a word processor's extra features? Roland Newman finds out.

Most users take advantage of only a few of their word processor's facilities. What is there in the rest of the package and can it help you in your work?

In my experience, although probably 90 per cent of all the work done on computers is word processing, it is also clear that only 20 per cent of the amazing array of facilities and writing tools that many word processing packages provide tend to be used. A colleague of mine, a professional full time writer of technical books, who showed me with great pride his high powered 386 computer and HP LaserJet II printer, was truly dumbfounded when I asked him how useful he had found the spell checker, thesaurus, outliner or indexing facilities. He had never learnt or even, I suspect, heard of them. He had bought a very full featured word processing package yet, in effect, had been using his whole expensive set-up purely as a sophisticated typewriter and had not found the time or motivation to learn the additional writing tools that were available to him.

I sat down with him for an hour and ex-

plained some of the facilities and tools available. He literally groaned when he learned that the many days he had struggled over constructing an index could have been reduced to a few hours. He rang me a week later and said his work output and efficiency had been transformed.

I think we can guess why he hadn't bothered to explore fully the word processing package in the beginning. The software arrives with a huge daunting manual; a real mental effort is required to learn what is often an apparently random and illogical series of commands and, in any case, you want to get on with your current work! Yet if you are using word processing even for personal correspondence, business letters, memos or complex technical reports and books a short period of study on your part will be amply rewarded. Apart from that you will be getting better value from the considerable sum of money you have spent on buying the package.

Let's look at some of these writing tools and which you can use best in your type of work. If you are a reader about to buy a word processing package it will give you some idea of the features you might require.

The main writing tool is the spell checker. It's really interesting how the market has changed. Only a few years ago, when the first spell checkers like Turbo Lightning appeared on the scene, they were truly hailed as a revolution in word processing. Today nearly all programs include a spell checker as a matter of course, though they can vary in size between 50,000 and 150,000 words. Most include the ability to add your own words within either a general or a personal dictionary, and some offer technical, legal or medical dictionaries that can be purchased separately. I am told, though I have not seen one yet, that dictionaries for foreign languages are also becoming available. Usually the spell checker can be configured as memory resident which means it can be called into use anywhere in a document at any time or, alternatively it can be installed and called up separately. It all depends on the capacity of your computer and whether you are running the program on floppies or on a hard disk.

Bear in mind that the spell checker only checks if a word exists in its dictionary and it cannot determine whether you meant to write mistress instead of distress or louse instead of house! You may also find that it may have difficulty with apostrophes, words with numbers, and plurals. If you can, try to ensure you get a British rather than an American version otherwise you will find it tiresome having to



change words like criticize and color to criticize and colour. Spell checkers can usually be used to check a word, part of a document or the whole of a document and many include a word count facility. When Prince Charles spoke recently of the difficulty his Private Office staff were having in spelling in the royal missives I wondered if the employees had access to a word processing system and spell checker for surely that would have solved the problem?

A few programs, including WordPerfect 5, Wordstar 5 and Microsoft Word now include a thesaurus which, by providing a list of alternative words, can immeasurably enhance a piece of writing. In academic writing where reference is made to other authors it is common to see that so and so 'states' repeated endlessly in page after page. Reference to the thesaurus in a word processing package will provide alternatives like comments, argues, contends, points out, advises, or imparts.

Antonyms, or opposites in meaning are also available in some programs and some even provide word definitions. For crossword aficionados I have seen one program which will tackle single word anagrams. The way of using the thesaurus is by placing the cursor on the word for which alternatives are required and pressing the appropriate key — as simple as that.

Perhaps the writing tool that comes next in importance is the outliner. In preparing to write, no matter the size or complexity of the work it is useful (some would say essential) to try to create a structure by listing relevant headings and subheadings which can then be moved and reorganised as the overall pattern of the work becomes clearer. The outliner program provides this facility, for the headings and subheadings can be expanded, amended, moved or even hidden as required. Detailed notes or preliminary thoughts can be 'hung on' to each heading or subheading and can then be moved as the initial headings are reorganised until the final structure emerges.

The most obvious application would be if you were planning the structure of a book, for the table of contents could be created as a list of ordered headings with the description of the contents of each chapter being the subheadings and notes. I must confess that learning to use an outliner in a word processing program does require a determined effort but once the principles and relevant key strokes are grasped it's difficult to understand how one ever managed without it. Outliners are also available as separate software packages with perhaps Grandview, PC-Outline, Thinktank, Ready!, Morell (for the Macintosh) being the best known. In addition WordPerfect 5 has a paragraph numbering system akin to an outliner, Wordstar 5 incorporates a special version of PC-Outline and Wordbench has a total writing system built around a special outliner program.

The 'search and replace' tool contained in many word processing programs can also be

very useful. Essentially this allows you to instruct the program to search for a word or phrase and then if necessary replace either with a word or phrase of your choice. All sorts of interesting variations are available. Let's say you have written a long technical report about the oil wells at Asad bin Hanna and then you discover the name is really Asid bin Hinna. Simply instruct the program to search for the incorrect text and correct the error, either automatically or at your specific request as each entry is found. A document can be searched backwards or forwards and upper case or lower case can be ignored or included as required.

Another important writing tool involves what are usually called block commands — used whenever you want to move or copy a block of text, either within your current working document or to and from another document, or to save or print a specific portion of text. I tend to use it when I find that a specific and long paragraph is in the wrong location within my current outliner structure or when I need to transcribe a long detailed quotation between documents. Technical writers will appreciate how time saving it can be to be able to avoid transcription errors with a 100 per cent accuracy.

Some word processing systems have a 'windows' facility which enables you to view two windows of different texts on the screen. You can edit text on either window by switching between the windows, and block moving text between each window is a simple procedure. Using the block system consists simply of marking the beginning and end of the text to be moved and then marking where the block is to be inserted within the document and then pressing the appropriate keys. It's easier still if your word processing system incorporates the use of a mouse for then the marking and destination point is actually perceivable on the screen as well as being a great deal faster.

For business users or those readers who are secretaries or treasurers of small voluntary organisations learning how to use mailmerge is essential, although it requires a dedicated learning effort. If you need to send out an identical document (say, a monthly newsletter or mail shot) to a wide range of different addresses then mailmerge enables you to print and despatch the same letter bearing individual salutations and addresses and thus making it appear that each letter has been individually prepared.

I don't think anyone is fooled nowadays into believing this but at least you have made the effort and you have saved yourself a great deal of work. Two specially prepared files are normally involved, the primary file (the text of the letter and the merge codes) and the secondary file (the list of addressees). The system can also be used to prepare mailing labels provided you have got the right printing setup. The really difficult part lies in understanding the merge codes and this can be, to say the least, a very tiresome business. But, if your

business or interest requires the use of mail-merge there is no doubt it can be a great time saver in the long run.

If you are a professional writer or have, from time to time, to prepare long complex documents or reports, a whole series of further writing tools are available to assist you in a number of word processing programs. These tools include the generating of a table of contents, tables of authorities and automatic cross-referencing within a text, automatic paragraph numbering and index creation. What many writers will find particularly useful is the fact that automatic cross-referencing can encompass page numbers, section numbers and even footnote numbering. What is still needed is some form of automatic sensing so that when you move a reference, 'above' can become 'below' but I have no doubt that this will soon be available.

Turning to indexing, if you have ever had to undertake the monumental task of preparing an index for your book or paper you will know there are few jobs more boring or tiresome. With the proper word processing program the task becomes reduced to marking the words or phrases (and subheadings if required) that you want included in the index and then the program will produce the required list. The first time you use indexing you may well find it rather tricky but, in principle, you should not find it too difficult. A number of variations of style and layout are possible including the capability of inserting in the index words or phrases which do not appear in the body of the document.

If you are involved in large scale word processing a perennial problem is finding a piece of text that you can remember writing but cannot remember which file it's in. In the last few years this problem has been tackled by text retrieval programs which include packages such as Gofer, Zylindex and Filepoint; and more recently the very sophisticated Magellan and Viewlink as part of their file management capabilities. Text retrieval programs can vary quite a lot in how they are used and the method of retrieval they utilise. Gofer, for example, will search for the text you wish to recall and will then copy it into the text of the program you are working on at the time. Some programs require you to index the files that you want to search; some are not memory resident so you have to go out of your current program in order to run the text retrieval program.

The term 'logical operators' used in these types of programs may deter you but it simply means that you instruct the program to search for any instances in all your files for all instances of (Money AND Income) AND NOT (Bank Manager AND Overdraft) OR (Porsche AND Bahamas). I must emphasise that these text retrieval programs are not part of word processing packages but are separate specialist software.

In connection with professional writing reference must be made to Wordbench which is

a relatively inexpensive package (about £100) which is specifically devoted to meeting the needs of writers and as far as I know stands alone in this area of software. Perhaps Wordbench's most novel tool is in its provision of four 'brainstorming' techniques to help overcome 'writer's block'. These consist of 'free-writing', when having selected a time period of up to ten minutes you are prompted to keep writing and not allowed to edit what you have written or go back and replace a word or phrase. 'Invisible writing' does not allow you to see what you have written and so be distracted; 'nutshelling' requires you to present the main purpose of your work in a few carefully thought out sentences; and 'goal setting' encourages you to think about and try to state exactly the goals of your writing and, perhaps, most important of all, your intended audience. Yes, I know they all sound rather weird but you give them a try — you will find it great fun and a revealing experience.

Wordbench as a dedicated writing program provides a whole series of inter-connected tools based on the premise that all the different parts of a document, book, paper or thesis are related to one another within an overall structure. Thus Wordbench provides an outliner, a notetaker — which allows notes to be gathered in the form of what might be called electronic notecards, and can be assigned to specific outliner headings and sub-headings — and a reference tool for entering and recording references to specific notecards created in the notetaker. All these are then gathered together in a 'folder' in the form of a normal word processing document — the Writer — as a first draft for editing. A spell checker and thesaurus program is then available as well as a viewer (a split screen program), a format tool (for enhancing and formatting the document), a print manager (for automatically generating table of contents, bibliographies and footnotes and so on) and the add-in manager, which includes the brainstorming techniques described earlier.

This brief review of the main writing tools in many word processing packages has, I trust, given you some idea of the writing facilities that are available to help you and increase your efficiency. In my experience it is not necessary to try to learn all of them — the key point is to know they exist and what they can do and then turn to them as you require.

There are two important tips: first, with any word processing do save your work at regular intervals — some programs can be configured to do this automatically; second, if you can afford it try to buy one of the books that may be available on using your software — they can often be much superior to the manual.

Having completed your masterpiece what then? Well, there is a whole wonderful experience awaiting you in connection with layout, fonts design and choice, page previews and style sheets and final printing. But that is all great fun and I do not think you will need any encouragement to delve into the manual.



MICRO BUSINESS COMPUTERS

3 YEARS WARRANTY

The items quoted here represent only a small part of our range. Please TEL or FAX with your specific enquiries.
All MBC machines are fully IBM compatible. All MBC machines are fully configured and ready to use.

MODEL	CPU SPEED	HARD DISK DRIVE	FLOPPY DISK DRIVE	MAIN RAM	SER/ PAR PORTS	FREE SLOTS	MONO SYSTEM	EGA COLOUR SYSTEM	VGA COLOUR SYSTEM
MBC88L	8088 10MHz	20MB (65ms)	360K/ 720K	640K	2/2	5	£599	£890	£990
MBC286L	80286 10/13MHz	20MB (65ms)	1.2MB/ 1.44MB	640K	1/2	5	£875	£1095	£1195
MBC286T Tower Case	80286 10/13MHz	20MB (65ms)	1.2MB/ 1.44MB	640K	1/2	5	£925	£1145	£1245
MBC286M	80286 12/16MHz	20MB (65ms)	1.2MB/ 1.44MB	1MB	1/2	5	£975	£1225	£1320
MBC386L	80386 16/21MHz	20MB (65ms)	1.2MB/ 1.44MB	1MB	2/2	5	£1395	£1695	£1795
MBC386T Tower case	80386 20/26MHz	20MB (65ms)	1.2MB/ 1.44MB	1MB	2/2	5	£1895	£2195	£2295
MBC386M 32K Cache	80386 25/41MHz	20MB (65ms)	1.2MB/ 1.44MB	2MB	2/2	5	£2495	£2795	£2895

MBC systems are supplied with: CHERRY 102 key keyboard, Monitor, full set of technical and reference manuals, complete MS-DOS 3.3 & GW BASIC or MS-DOS 4.01 (with every 286 & 386 machines).

UPGRADE	PRICE
30MB (65ms)	£40
40MB (40ms)	£80
40MB (28ms)	£145
65MB (28ms)	£210
80MB (28ms)	£330
110MB (28ms)	£440
640K RAM to 1MB	£60
1MB RAM	£185

ADD ON EXTRA

360K floppy drive	£60
1MB floppy drive	£80
720K floppy drive	£70
1.44MB floppy drive	£90
Genius mouse + software + mouse packet	£55
Maths coprocessor	
8087-1	£100
80287-8	£145
80287-12	£240
80387-16	£335

MBC PORTABLE

MODEL	CPU SPEED	HARD DISK	FLOPPY DRIVE	MAIN RAM	LCD (11")	GAS-PLASMA (11")
MBC88PC	8088 10MHz		360K & 720K	640K	£745	£935
MBC88P20	8088 10MHz	20MB (65ms)	360K/ 720K	640K	£935	£1125
MBC286P20	80286 10MHz	20MB (65ms)	1.2MB/ 1.44MB	640K	£1195	£1375
MBC286P40	80286 12MHz	40MB (40ms)	1.2MB/ 1.44MB	1MB	£1325	£1545

Full range of **PRINTERS** are available EPSON, BROTHER, NEC, STAR, CANON, etc., call us for the latest **LOW PRICES**.

Over 5000 (**SOFTWARE**) Titles available call for **LOWEST PRICES**.

All prices shown exclude VAT & delivery. All major credit cards are accepted

Salesline: 01-706 4224 Fax: 01-262 0506
Service Hotline: 01-262 0511

MBC, 105 CRAWFORD ST., LONDON W1 HIAN.



Analogue: In monitor technology, analogue signals represent colours through voltage levels rather than the simple on/off signals of digital monitors. This makes possible a vastly greater range of colours.

ASCII: The American Standard for Computer Information Interchange defines what numeric codes are used to represent numbers, punctuation and letters of the alphabet.

AT bus: The AT-bus found on 80286 and 80386-based machines comprises two parts: the original 8-bit wide IBM PC expansion slot and an extension to provide a 16-bit data path. AT expansion slots will accept PC expansion cards.

BIOS: On many computers the Basic Input Output System is a set of simple routines which a program uses when it wants to access parts of a computer's hardware, such as the disk drive or display. The BIOS is usually contained in ROM chips. On PC compatibles these are often produced by companies such as Phoenix, Award or AMI.

Bus: The bus is the electronic communications channel through which the CPU, memory and other components of a computer communicates with each other. Sometimes the bus is made accessible to external devices such as plug-in cards through expansion slots.

CGA: The Colour Graphics Adapter was the first colour graphics standard IBM made available on its PC. In text mode it provides 25 lines of 80 characters with 16 text colours and 8 background colours. There is a 40-characters per line text mode as well. For graphics the CGA has 320 dots horizontally by 20 lines in two palettes of four colours (red/green/brown/black and cyan/magenta/white/black) as well as a 640 by 200 two-colour mode.

Contrast Ratio: The relationship between the 'white' and 'black' parts of a LCD screen. The higher the ratio the sharper the screen.

Control key: An instruction to a computer program

produced by simultaneously pressing the Control key and another character.

CPU: The Central Processor Unit is the main chip which controls the computer. IBM PC compatibles are based around a family of CPUs from Intel and have names such as 8088, 80286, 80386. Many other machines such as the Macintosh, Atari ST and Commodore AMiga are based around a family of chips from Motorola with names like 68000 and 68020. Programs written for one family of CPUs will not run unaltered on chips in the other family.

Dry cell: The ordinary non-rechargeable batteries which are thrown away when they can no longer supply sufficient current.

EGA: In addition to emulating the CGA colour standards, IBM's Enhanced Graphics Adapter standard adds extra graphics modes including 640 dots or pixels horizontally by 350 vertically in 16 colours out of a total palette of 64. Many companies have produced EGA cards which go beyond this and provide 640 by 480 resolution. To display these graphics it is necessary to use a suitable colour monitor.

Expanded memory: Referred to also as LIM memory, because the standard was agreed between Lotus, Intel and Microsoft, expanded memory enables computer programs to keep in memory more data than can be fitted in the conventional 640k that a PC uses. Unlike Extended Memory, expanded memory can be used on any PC-compatible and is usually provided on a plug-in card. The memory is divided into logical 'pages' and software is provided to swap pages around so that the necessary information is within reach of the computer application.

Expansion chassis: A set of connectors or slots for expanding a computer's memory or function.

Extended memory: On an IBM AT or compatible, memory which lies outside the first 640k used for running programs can be referred to as extended memory. This memory is not directly accessible to conventional PC

programs but can be used by operating systems and special software written to run only on 80286 or 80386-based systems.

Hardcard: A plug-in card which carries a hard disk drive and all the necessary support circuitry.

Hercules: This, originally monochrome only, graphics standard devised by a company called Hercules provides a resolution of 720 dots horizontally by 348 vertically. The resulting text and graphics is far better than the CGA standard. Hercules compatible graphics are very often provided by PC-compatible manufacturers on their monochrome machines and are supported by most computer applications.

LCD: Liquid Crystal Displays are most commonly found on laptop computers. When an electric current is passed across certain types of crystal it changes the way they polarise light passed through them. These crystals are sandwiched between plates of glass or plastic to make a display as found on computers and also digital watches.

MCA: The Micro Channel Architecture is the bus design of IBM's PS/2 family of computers. It allows the main computer to communicate with external devices through special and video capabilities. The MCA expansion slots will not accept cards designed for the earlier PC and AT expansion busses.

Modem: (modulator/demodulator) A piece of hardware which turns a computer's digital data into audible signals so that they can be transmitted down conventional telephone wires. When it receives such audible signals the modem converts them back into digital information.

Motherboard: Most computers are designed around one major piece of circuit board which holds the CPU, memory and support chips. This motherboard may also hold the video chips, hard and floppy disk controllers and input and output circuits as well as any expansion slots.

MS-DOS: The most common

operating system run on PC-compatibles. It is produced by the Microsoft Corporation which works in conjunction with IBM. IBM's version is called PC-DOS.

NiCad: A rechargeable-battery technology based on Nickel and Cadmium.

Operating system: The operating system is the software which provides the link between a computer program and the computer hardware. An application will use the operating system to access disk drives, screen and memory, as well as connections to such devices as printers, the keyboard, mice and modems. In addition the user can use the operating system directly to manage disk-based files.

OS/2: An operating system for 80286 and 80386-based PCs which allows for a number of applications to multi-task.

Parallel: A parallel port is usually used to connect a computer with a printer. Data is sent 8 bits at a time along eight separate wires.

PC bus: The expansion slots in an PC-compatible allow hardware such as memory, graphics, modems and network cards to be added in to the computer.

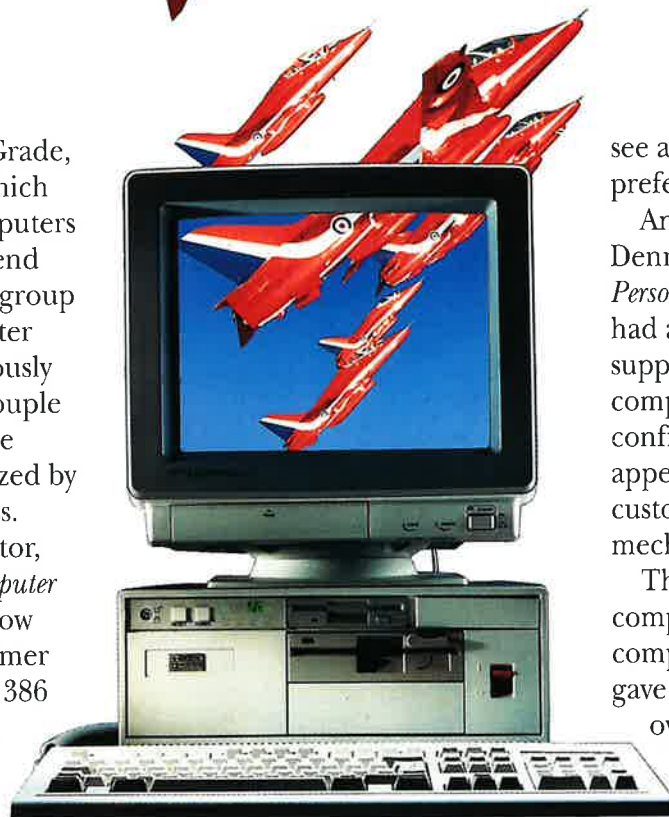
RAM: Random access memory is the main kind of memory in the computer. RAM chips hold the programs and data. Random access memory is capable of being changed by software - that is, each memory location can be 'written to' as well as having its contents read. The memory is 'volatile', however, which means that RAM is wiped clean when the power is turned off.

RAMdisk: A part of memory configured to store files like a disk drive. Though much faster than a disk drive, its contents are lost when the computer is switched off.

Real-time clock: Battery-powered circuitry which keeps track of the date and time, even while the computer is switched off.

RS232: The most common standard for serial communications.

HI-GRADE TAKES OFF



Yes, it's take-off time for Hi-Grade, the dynamic London firm which makes value-for-money computers and markets them direct to end users. Founded in 1986 by a group of young lecturers in computer science, the firm grew vigorously but quietly during its first couple of years. Now its strengths are starting to be widely recognized by both customers and the press.

One respected commentator, Guy Kewney, in *Personal Computer World*, praised Hi-Grade's know how and dedication to customer service. Reviewing one of its 386 computers, he declared that not only was its price very tempting but it was hard to

see any technical reason for preferring rival machines.

Another well known journalist, Dennis Jarret, wrote in *What Personal Computer* that Hi-Grade had acquired a reputation for supplying clients with solidly built computers and customised configurations. The firm, he said, appeared to believe satisfied customers to be its best sales mechanism.

The same magazine, in a comparative review of 386 computers costing under £2,000, gave Hi-Grade top marks, with an overall rating of four stars. No other machine got more than three stars.

HI-GRADE QUALITY & FLEXIBILITY

Our Systems are designed to fit a multitude of options and applications but if you wish to configure your own system ring us on 01-482 4024 or write to us for a free quotation and expert advice for the system best suited to your requirements. Our showroom is open for free demonstrations from Monday to Friday, 9.30 to 6.00pm.

THE HI GRADE SYSTEMS

Hi-Grade 286/12 80286 12 Mhz..... £995
 Hi-Grade 286/16 80286 16 Mhz..... £1095
 Hi-Grade 286/20 80286 20 Mhz..... £1195
 Hi-Grade 386SX 80386sx 16 Mhz..... £1195
 Hi-Grade 386X 80386 20 Mhz..... £1395
 Hi-Grade 386/25 80386 25 Mhz..... £1695

All systems include:

- 1 Mb RAM upgrade to 8Mb on board
- LIM v4.0 support
- Page interleaved memory scheme achieves 0 wait states
- 5.25" 1.2 Mb & 3.50" 1.44Mb floppy disk drives, both capable of reading and writing to lower density diskettes
- Maths co-processor option
- 1:1 Interleaved hard disk controller, doubles up the transfer rate over standard AT controllers
- 102 keyboard with legends double moulded for long life
- Hercules monographics adapter & Mono monitor
- 2 Serial, 2 parallel, 1 games port 4 Expansion slots free
- MS-DOS 4.01 with GW BASIC
- Microsoft mouse & Windows
- Ashton Tate's Framework II integrated package
- 1 Year warranty for labour and parts
- hot line technical support

HARD DISK UPGRADE

20 Mb 30 ms MFM £170 • 40 Mb 25 ms MFM £300
 70MB 22 ms MFM £575 • 157 Mb 16ms ESDI £1055
 • 338 Mb 16ms ESDI £1605

COLOUR UPGRADE

All upgrades include the NEC Super-VGA-16
 VGA mono with analogue monitor £165
 VGA colour with NEC multi-sync 2A £395
 VGA colour with NEC multi-sync 3D £495

All systems prices and specifications are subject to change without notice. VAT and delivery are extra.

HI-GRADE
COMPUTERS LTD

13/15 KENTISHTOWN ROAD.
 LONDON NW1 8NH
 TELEPHONE 01-482 4024 FAX 01-267 6138

To Hi Grade Computers, 13-15 Kentish Town Road, London NW1 8NH. Please send me an information pack

Name _____ Position _____
 Company _____ Address _____
 Phone _____ Fax _____

FREE
 With all systems
 Framework software,
 MS Dos, MS Mouse and windows
 Retail value £775
 See us on Stand 1336 at the Personal Computer Show

NEW FROM SCHNEIDER

— **EUROPC** —

The computer for all the family



Complete with **FREE**
Software worth **£145.00**
MICROSOFT® WORKS
Integrated home/business package
Word Processor · Graphics
Spreadsheet · Communications
& Database



EUROPC the new generation
home and small business micro
from Schneider, West Germany's
leading manufacturer of micro-
computers. It's the ideal
introduction to the world of serious
computing in the home or in the
office.

- Stylish one-piece design for keyboard — processor unit complete with the latest 3½" 720kb floppy disc drive.
- High speed 8088-1 microprocessor.
- Built-in expansion capability.

- Ports for external 5¼" floppy disc drive, 20mb hard disc, mouse/joystick & printer.
- 86 key AT compatible keyboard with number block.
- Available with 12" mono or 14" colour monitors.
- Renowned German quality & reliability.
- MS-DOS 3.3 & GW Basic software package MICROSOFT WORKS comprising Word Processor, Spreadsheet, Database, Graphics and Communication — RETAIL VALUE £145.00

Euro PC — computing power for all the family. You can select from a vast range of industry standard business,

educational and games software, it's all at your fingertips when you choose the EuroPC from Schneider.

Ask your local computer shop for the Schneider EuroPC — prices start from just £399.00 + VAT complete with monitor and **FREE MICROSOFT WORKS** software package.

Schneider
Made in Germany

SCHNEIDER COMPUTERS LIMITED
SCHNEIDER HOUSE 5 HARROWDEN ROAD
BRACKMILLS NORTHAMPTON NN4 0HW
TEL: (0604) 766572

All trade marks acknowledged